SIMULATING STORYTELLER-AUDIENCE INTERACTIONS IN DIGITAL STORYTELLING:

QUESTIONS, EXCHANGE STRUCTURES & STORY OBJECTS

Ilda Ladeira MSc.

Supervised by

Prof. Gary Marsden

&

Dr. Lesley Green

Thesis presented for the Degree of DOCTOR OF PHILOSOPHY
in the Department of Computer Science, UNIVERSITY OF CAPE TOWN
November, 2012

Ok, my name is Noor… I was born in District Six. And, I'm also one of the founders of this museum. And I always say it's a very, very important museum. Especially for our youth, you know, our children, because they don't know anything what happened during, Apartheid years, and we tell the story. It's a very, very, very important part of our history."

(Noor Ebrahim,
District Six ex-resident &
District Six Museum guide)

It's called a museum - I have a problem with that because to me normally a museum is a space where you stare at dead artefacts and they stare back at you. At this stage I'm not a dead artefact yet, so I call it … a space of memory. Memory, my memory and memories of people who lived in District Six. And this museum also represents what happened throughout the whole of South Africa, 'cause what you are hearing here is what happened throughout the rest of the country.

(Joe Schaffers,
District Six ex-resident &
District Six Museum guide)

Publications

Some of the ideas and results of this dissertation have previously appeared in:

Ladeira, I. & Nunez, D. (2007) Story worlds and virtual environments: Learning from oral storytelling. *Proceedings of 10th Annual Workshop on Presence 2007*, Barcelona, Spain.

Bidwell, N., Ladeira, I. & Sigaji, X. (2008) Digital storytelling design learning from non-digital narratives: Two case studies in South Africa, *5th National Oral History Conference 2008*, East London, South Africa

Marsden, G., Ladeira, I., Reitmaier, T., Bidwell, N. J. & Blake, E. (2010) Providing a Digital Voice for Storytellers in Africa, Proceedings of the 8th Culture and Computer Science Conference, pp. 101-132, Berlin, Germany

Marsden, G., Ladeira, I., Reitmaier, T., Bidwell, N. J. & Blake, E. (2010) Digital Storytelling in Africa, International Journal of Computing, vol. 9(3), pp. 257-265

Ladeira, I., Marsden, G. & Green, L. (2011) Designing Interactive Storytelling: A Virtual Environment for Personal Experience Narratives. *Proceedings of the 13th International Conference on Human Computer Interaction INTERACT 2011*, Lisbon, Portugal

Acknowledgements

Noor Ebrahim and Joe Schaffers: you welcomed me to the museum floor, befriended me, told me stories for hours and became the voice of this work. This project is dedicated to you.

Linda Fortune: for welcoming me into your home and sharing your memory box with me.

Menisha Collins: for sharing your stories and allowing me to embroider memory cloths with you.

The District Six Museum staff: for collaborating with me over the past seven years, most especially, Mandy Sanger, Bonita Bennett, Margaux Bergman and Chrischene Julius for their direct involvement with this work.

Kay McCormick: your insights and reading suggestions had a defining impact on this project and I am so grateful for your generosity in teaching me about linguistic perspectives on personal narratives.

Muya Koloko: for sharing the task of transcription, helping recruit participants and being generally awesome to me.

My friends & lab-mates – CVC old-timers & ICT4D new recruits alike: Drew, Dom, Duke, Graeme, Chris, Raymond, Fritz, Mike, Sena, Muthoni. And, especially Bertus & Jak for helping with experiment set-up among other things; Rudy, Sarah, Susan, Ronel, Marsh, Shikoh, Thomas, Nic, Bonnie Nina, Rebecca, Ben, Lizanne & Bill for the numerous encouraging, pow-wows; Cara & Andrew for providing support, wine and a happy working space on a regular basis.

My family, Mãe, Pai, Luisa, Isabel, James & Jessy: the Portuguese cheering squad.

Lesley Green: for being so keen on multi-disciplinary work, your tolerance of my positivistic roots and helping me understand how to be an ethnographer.

Gary Marsden: for being incredibly patient and trusting of my vision for this project, sharing your wisdom over excellent coffees and spray-painting the keyboard used in Study Four.

Dave: for being my hutch-mate, for talking things out with me when I needed it (even when I was grumpy) and for allowing me to lean on you. A lot. I love you.

To all of you

Thank-You, Baie Dankie, Muito Obrigado, ¡Muchas Gracias

Abstract

This work revolves around the design and evaluation of digital storytelling simulating real personal storytelling. Study One was an ethnography, of real storytellers, which revealed types of narratives, dynamism and interactivity in storytelling. This was used to design digital storytelling which simulated the behaviours of real storytellers. Three design ideas, *questions*, *exchange structures* and *story objects*, were prototyped and evaluated in Studies Two, Three and Four. Study One took place over three months at the District Six Museum, Cape Town. We studied narratives from three guides about their Apartheid-era experiences. Discourse analyses showed the narratives: (a) were structured as clauses, each relating a story event or thought; (b) varied minimally across retellings; (c) incorporated storyteller-audience interactions (periodic questions) between clauses which matched teacher-student interactions described by Sinclair & Coulthard (1975); and, in exchange structures, guides periodically asked audiences questions; and (d) incorporated the museum exhibit and memory box objects. The digital storytelling design focused on: simulating *questions* and *exchange structures;* and *story objects*, allowing user-triggered narratives. We implemented a virtual environment containing two interactive storyteller agents, and several story objects. Study Two (n=101) manipulated the effect of questions and exchange structures on story experience. Study Three (n=69) manipulated the effect of story objects on story experience. Story experience was composed of: *interest* in the narrative context, *enjoyment* of and *engagement* in the storytelling, and the *storytelling realism*. These were measured with a questionnaire created for these studies; psychometric analysis showed it to be valid and reliable. Linear models showed questions increased interest (F=5.72, p=0.02) and engagement (F=3.92, p=0.05) while exchange structures increased interest (F=6, p=0.02), enjoyment (F=4.14, p<0.04) and engagement (F=10.53, p=0.002). Usage logs showed participants interacted readily with both while the agents could answer a mean of 35% of user questions. Story objects did not impact story experience. Study Two and Three's participants reported high story experience scores and predominantly positive qualitative feedback. In Study Four (n=93), the prototype was exhibited at District Six Museum for nine days. We observed visitor interaction, logged usage automatically and gathered voluntary feedback, which was largely positive. Visitors tended to engage passively with the prototype and linear models showed age was a predictor of the number of question (F=31.75, p<0.001) and exchange structure (F=4.45, p<0.04) inputs. Additionally, multiple visitors would use the prototype simultaneously. We conclude that integrating different methodologies allowed us to simulate real storyteller-audience interactions and that the questions and exchange structure interactions we designed improved experiences of digital personal narratives. This design may be replicated by others seeking to similarly preserve the experience of personal storytelling.

Table of Contents

Table of Figures

Chapter 1
Introduction

Telling stories about one's personal experience is part of the fabric of everyday life – it pervades casual conversation and is a means for construing and conveying one's experiences to others (Sacks, 1992; Norrick, 2000; Ochs & Capps, 2001; Martin & Rose, 2003). Personal narratives are furthermore a compelling way to convey the impact of historical events in a way that audiences can relate to (Maynes, et al., 2008). For instance, Anne Frank's *The Diary of Young Girl* (Frank, 1947) gave readers personal insights into the experiences of Jews during the Holocaust. The opportunity to hear personal perspectives on significant past events, told in-person by those who experienced them first-hand, lends captivating, relatable understandings of the past. However, passing on history in-person in this way depends on the availability of storytellers. This project represents an effort to digitally preserve personal storytelling that captures the experience of hearing them told in-person, long after the storytellers are no longer available.

Our work took place in close collaboration with the District Six Museum (2012) in Cape Town. During South Africa's Apartheid regime, neighbourhoods were racially segregated leading to the forced removal of residents living in mixed-race neighbourhoods. Areas close to, or in, cities were typically reserved for white people, while less desirable areas further away from city centres were allocated for other races. Buildings, including houses, in vacated neighbourhoods were usually demolished to make way for new ones. District Six is a well-known example of such a neighbourhood; land developers refused to build there and it still stand largely empty today. Forced removals prompted the establishment of "townships" such as Soweto in Johannesburg and Khayelitsha in Cape Town, and homelands, such as Ciskei and Transkei. Hence, they significantly influenced the layout of South Africa's suburbs as they still are today. The museum commemorates forced removals as a country-wide phenomenon, with special reference to District Six. Many ex-residents are involved in its running and the museum strives to be a space for their memories and stories. The most direct way in which visitors experience this is through the storytelling of the museum's two full-time guides and District Six ex-residents, Joe Schaffers and Noor Ebrahim. To say that they provide an important service in these roles is an understatement. The museum is part of Cape Town's social fabric: many tourists, locals and school groups visit daily and have the opportunity to engage with Joe and Noor. Hearing about their experiences conveys an invaluable, and relatable, understanding of Apartheid's human impact. Unfortunately, the community of District Six ex-residents is ageing. When Joe and Noor depart from the museum, visitors won't able to listen to their stories first-hand and there are, currently, only a few ex-residents who could possibly take their place. The problem of preserving oral histories in Africa, and in the realm of cultural heritage, is certainly not new. Often narratives, folklore and indigenous knowledge are transmitted orally, and several previous projects have explored the use of technology for preserving histories and knowledge in way that is faithful to this. (Green, 2007; Bidwell & Ladeira, 2008; Marsden, et al., 2010) Additionally, cultural heritage experts and historians recognize the resonance of personal experience narratives for conveying history and numerous digital storytelling projects focus on collecting personal stories and making them publically available.

1.1 Research Overview: Understanding & Emulating Personal Oral Storytelling

Our work was shaped by one broad initial motivation: the preservation of personal narratives, passed on through oral storytelling, before they are lost along with their storytellers. We wanted to design a digital storytelling system to effectively conserve and deliver narratives in an engaging way. The common solution to this problem is to record people telling their stories; however, there is much that cannot be captured this way. Video and audio recordings do not allow a listener to interact with the storyteller and the narratives are the same each time a recording replayed. But, oral storytelling is neither a static nor passive experience. Narratives told many times over vary across retellings and storytellers interact with listeners. In our work, we wanted to capture not only narrative *content* but to simulate the experience of oral *storytelling* itself. We used a multi-disciplinary approach combining ethnography, linguistics, discourse analysis, human-computer interaction and controlled experimental studies. We also worked in four major, distinct phases. First, we sought to study real-life personal storytelling as a means of gathering design ideas for a dynamic and interactive digital storytelling design. We focused on answering the following two research questions:

1. *What **kinds of narratives** are used to convey personal experience of historical events?*

2. *What techniques are used in oral storytelling to make personal narratives (a) **dynamic** and (b) **interactive**?*

To address these, we conducted a thorough ethnography (Study One) of the storytelling of ex-resident guides at the District Six Museum. We focused on: (1) the kinds of narratives used to convey personal experiences; (2) the ways in these narratives varied when told on different occasions; and (3) how the guides interacted with audiences. Prominent findings included: narrative structure and content only varied in minor ways across multiple retellings; audiences consistently only interacted with the ex-residents during pauses in narratives; the interactions were almost always questions-based with audiences asking the ex-residents questions and ex-residents asking audiences question as a means of testing their knowledge in inviting them to participate in the storytelling process; the objects in the museum were reliably associated with particular narratives and sometimes served to trigger those narratives.

The project's second phase involved translating Study One's prominent findings into a design for a digital storytelling prototype. The design and implementation process included the District Six Museum as a collaborator and stakeholder in the eventual prototype. The prototype embodied two main design ideas:

- Simulating question-based storyteller-listener interactions:
    a. *Questions* which allowed users the ability to ask the storyteller agents questions
    b. *Exchange structures* in which the storyteller agents periodically ask the user questions and iteratively guide them towards the correct/appropriate answer(s)

- *Story objects* which when selected would trigger an associated narrative.

The third, phase involved a rigorous evaluation of the above design ideas; hence we wanted to answer the following two research questions:

3. *Are audience-storyteller interactions from real-life personal storytelling effective in digital storytelling? We consider two forms of interactivity:*
    a. ***Questions**: The user is able to input questions to a storyteller agent by raising their hand during a narrative and during question opportunities, where the storyteller agent accepts multiple, consecutive questions.*
    b. ***Exchange Structures**: the storyteller agent poses a question and prompts the user to input attempts at answering it until the correct answer(s) are reached.*

4. *Is the use of **story objects** as a mechanism for allowing the user to trigger narratives more effective than presenting narratives in a predetermined order?*

We addressed these through two studies which took the form of controlled experiments. Study Two tested the effectiveness of the question and exchange structure interactions, whilst Study Three tested story objects. We judged their effectiveness by measuring participant's *story experience,* a multi-dimensional construct consisting of: interest generated in finding out more about Apartheid history and forced removals; enjoyment; engagement and how real the storytelling seemed.

In the final phase, we took the prototype back the District Six Museum, the setting that had influenced its design, to see how effective it was as a museum exhibit. Thus answering our final research question:

5. *Is an interactive digital storytelling system effective for engaging **museum visitors**?*

We used some of the major outcomes of Studies Two and Three to improve the prototype and then, in Study Four, deployed it at the District Six Museum for nine days to see how museum visitors responded to and engaged with an interactive digital storytelling system.

1.2 Dissertation Outline

Chapter 2 presents previous work and ideas that influenced our approach to novel digital storytelling design for preserving personal experience narratives told in a museum setting. We review the fields of digital and virtual storytelling and explain how our work intersects the two. Previous work, from a variety of disciplines, on understanding and simulating museum guides is also presented. Well-established linguistics work on the structure and genres of personal experience narratives is presented. Finally, we discuss previous work from oral storytelling and conversation research in understanding the interactions that occur between speakers and listeners, concluding with discourse analysis work on such interactions in classroom settings.

Chapter 3 describes our motivations for studying the storytelling of ex-residents at the District Six Museum and subsequent three-month ethnography (Study One) during which we observed their tours and storytelling and recorded and transcribed seven full tours. We describe the museum, the ex-residents we encountered and their tours.

Chapter 4 focused on how we answered our first two research questions regarding the kinds of personal narratives we observed and ways in which the ex-resident's storytelling was dynamic and interactive. The analysis focuses on the seven transcribed tours; in these we identified those personal experience narratives that appeared most often and analysed those in detail in terms of their structure and the interactions that took place during them.

Chapter 5 describes how the findings of Study One led to two foci for digital storytelling design: simulating user-storyteller interactions questions and exchange structures; and the use of story objects to trigger narratives. This chapter explained why we chose to implement a prototype as a VE containing two interactive storyteller agents and details the specific designs for questions, exchange structures and story objects. We describe how the museum contributed to the prototype's design, the implementation and resultant user experience.

Chapter 6 describes our approach to evaluating the digital storytelling prototype designed in the previous chapter. The design of Study Two and Three for testing the effectiveness of user-storyteller interactions and story objects, respectively, is detailed. These studies tested the effect of user-storyteller interactions and story objects on user's *story experience*, which we conceived as a multi-dimensional construct encompassing various aspects of experiencing a narrative in the domain of cultural heritage. We detail the development of a questionnaire for measuring story experience. We also describe other data gathered, namely user activity logs and qualitative feedback.

Chapter 7 presents the results of Studies Two and Three including: ad-hoc observations of study participants; an analysis of logged user activity showing actual interaction with the prototype's storyteller agents; a psychometric analysis of our story experience questionnaire; the effect of questions, exchange structures and story objects on participant's story experience; and a review of qualitative feedback.

Chapter 8 describes Study Four where we deployed the storytelling prototype in the setting that inspired it – the District Six Museum. We begin by describing how results from Studies Two and Three were used to improve the prototype before Study Four. We then detail how the prototype was deployed and how we gathered data regarding museum visitor's reactions to it. Next, we describe the study's outcomes including our observations of visitors, a review of the user activity logs, visitor's qualitative feedback and the reactions of the museum staff, including the ex-resident guides. We conclude by describing how the Study Four's findings were relayed back to the museum.

Chapter 9 discusses the results of evaluating the storytelling prototype and the design ideas it embodied. The results of Studies Two, Three and Four are considered collectively as we consider: the performance of our story experience questionnaire; the efficacy of the question and exchange structure interactions; the efficacy of story objects as anchors which trigger narratives and overall user responses to the prototype in both the controlled settings of Studies Two and Three and the public museum setting of Study Four

Chapter 10 presents a summary of our work along with the main findings. We also discuss numerous future work possibilities.

Chapter 2
Background

This project was concerned with preserving personal experience narratives digitally in novel, compelling ways. We were prompted to pursue this problem because our collaborators, the District Six Museum, wanted to explore ways to preserve the narratives of former District Six residents and disseminate them in a way that captured the experience of listening to them in person. As Brooks (1996) points out, real storytellers establish a special connection with audiences that is difficult to simulate digitally. We chose to concentrate our efforts on understanding and simulating real-life storytelling's dynamism and interactivity. Here we review relevant previous work on digital and virtual storytelling (Section 2.1), linguistics work on the structure of personal experience narratives (Section 2.4) and speaker-listener interactions (Section 2.2), and, finally, we review previous work on creating agents which simulate the behaviours and interactions of human museum guides and tutors (Section 2.3).

2.1. Digital and Virtual Storytelling

In general, digital storytelling tends to be concerned with capturing, archiving and presenting real-life stories, without allowing listeners to alter their plots. Meanwhile, virtual storytelling predominantly presents fictional narratives which users may influence or, even, author. Our work may be seen as an intersection of these two: we wanted to create digital versions of real-life stories where users could interact with story content *without* altering their plots.

Digital storytelling, a relatively new field, researchers have explored a wide range of forms for presenting narratives ranging from podcasts to multimedia "mini-movies" which combine video, photographs, animation, music and text (BBC, 2008). Broadly speaking, digital storytelling can be described as capturing real-life, narratives using technology. The goal may be to memorialise a snapshot of a particular time period or place (BBC, 2009; USC Shoah Foundation Institute, 2012; University of Cape Town, 2012), facilitate expression of self through storytelling or reinforce community through the sharing of narratives (Bidwell, et al., 2010; Jones, et al., 2007; Jones, et al., 2008). Even blogs, slide shows, photographs and videos shared online are considered a form of digital storytelling (Adams, 2005). Some projects focus on user generated content by providing ways for users to tell their own stories while others focus on creating publically accessible archives focusing on the organisation of narratives and how they are viewed by users. The platforms used this work have included online archives (USC Shoah Foundation Institute, 2012), mobile devices, including mobile phones (Bidwell, et al., 2010) and even customised public displays for storing and sharing a central library of narratives (Jones, et al., 2007; Jones, et al., 2008).

Some digital storytelling projects explored interactivity in browsing a collection of narratives. For instance, the India Digital Heritage Project combines active exploration with passive watching of narrative recordings. Users explore a 3D visualisation of a cultural heritage site while accessing

narrative recordings, at various locations, which may be played and paused during exploration (Sankar, et al., 2009; Adabala, et al., 2010). Other digital storytelling projects have explored creating "memory boxes" where personal narratives may be associated with tangible objects such as photographs or jewellery. Frohlich & Murphy (2000) describe initial work on a box containing sentimental objects, each associated with an audio recording that plays when the object is removed from the box. Their "Living Memory Box" was designed with the aid of ethnographic interviews and focus groups in order to understand how people collect keepsake objects. Another project created a memory box consisting of a platform on which to place objects while recording information about them; a recording device; and user interface for recording narratives and searching through one's archive (Stevens, et al., 2003). Dautenhahn (1998) argues a similar idea may be applied in intelligent virtual environments (IVEs) populated with agents and objects associated with user's autobiographical narratives.

To our knowledge, no digital storytelling has explored interactive ways to present narratives themselves. Virtual storytelling systems, on the other hand, have typically explored interactive, non-linear storytelling where users can affect story narrations to varying extents (Cavazza & Pizzi, 2006): incidental interactions that do not alter a narrative's outcome (Madej, 2003); observing narratives and intervening or controlling characters (Cavazza, et al., 2002; Riedl & Young, 2003; Riedl, et al., 2003); and interacting with story characters directly (Hayes-Roth, 1999; Mateas & Stern, 2005). Numerous projects have also explored toolsets that allow for the automatic generation or adaptation of narratives based on user actions or input (Silverman, et al., 2003; Szilas, et al., 2003; Steiner & Tomkins, 2004; Barrenho, et al., 2006; Skorupski, et al., 2007). Most typically, virtual storytelling systems take the form of virtual reality (VR) (Pausch, et al., 1996), or augmented reality (AR) (Bimber, et al., 2003) environments. These may allow users to observe or participate in dramas being played out by character avatars (Cavazza, et al., 2002; Dow, et al., 2007), or encounter a human-like storyteller avatar which may or may not be interactive (Brown, et al., 2003; Silva, et al., 2003; Silva, et al., 2004; Ladeira & Blake, 2004; Blake & Ladeira, 2011).

A number of projects have applied virtual storytelling to the domain of cultural heritage, for example, the Interactive Storytelling Exhibition Project immersed users in a mixed media VE to explore ancient Egyptian history (Danks, et al., 2007) and Virtual Harlem which sought to teach users about African-American cultural movements in the early 1900's Harlem (Johnson, et al., 2002). But, more often, virtual storytelling predominantly deals with fictional content or "interactive dramas" where users manipulate or completely author the plots (Brooks, 1996; Cavazza & Pizzi, 2006). Hence, a well-known problem in this field is striking a balance between producing coherent, meaningful narratives while giving the user authorial freedom (Clarke & Mitchell, 2001; Steiner & Tomkins, 2004; Riedl, 2006). For design inspiration, virtual storytelling has often drawn from classical drama and narratology theories. (Cavazza & Pizzi, 2006) For example, the AR system, Geist, combined Propp's seminal work (Propp, 1968) on folk tales' morphological structure and conversational interactions. There narrative was defined as a collection of pre-defined dramatic scenes, each with a morphological rating. Conversational interactions (such as talking, gesturing and miming) between the avatars and user, led to variants of the storyline which always lead to the same ending, thereby fulfilling the morphological function (Braun, 2006). Meanwhile, digital storytelling has drawn design inspirations from traditional film techniques; some have even used ethnography and open-ended deployment of simple systems to understand how potential users conceptualise and express their

narratives (Bidwell, et al., 2010; Bidwell & Ladeira, 2008; Jones, et al., 2008). Although real-life storytelling has long been studied in linguistics and anthropology, very little virtual or digital storytelling work has drawn design inspiration from these fields. Next, we begin to describe work from these fields that proved instrumental in our work.

2.2. Personal Experience Narratives

Storytelling is one of the remarkably universal attributes of cultures the world over and it serves a variety of purposes. It is a means for passing cultural beliefs and ideals on to future generations, teaches moral lessons and entertains listeners (Propp, 1968; Bauman, 1986; Turner, 1993). Narratives have, over time, been conveyed in a variety of forms including myths, novels, songs, rituals, folklore and films (Turner, 1993). In our work we have focused on personal experience narratives told orally. Personal experience narratives are those where the storyteller tells of events experienced by themselves or acquaintances; they can also include word of mouth experiences (Pridham, 2001; Martin & Rose, 2003; Labov, 2010). Personal storytelling is understood to fulfil a number of distinctive purposes both for listeners and the storytellers themselves. It allows listeners to understand storyteller's perspectives on their experiences and, as we shall later see, learn certain lessons from their experiences. Personal storytelling also allows storytellers to make sense of and organise their own recollections of their own experiences, (Labov, 1972; Norrick, 2000), in some cases, work through traumatic or emotional experiences (Frank, 1995; Martin & Rose, 2003). This section focuses on well-established understandings of the structure and genres of personal experience narratives and the phenomenon repeating narrative retellings.

2.2.1. Structure and Genres

The structure of narratives has been studied for various reasons and with a variety of interesting outcomes. Folklorist Vladimir Propp analysed Russian folk-tales and found that difference folk tales exhibited significantly structural similarity leading to the formulation of a basic structure exhibited by most folk-tales (Propp, 1968; Turner, 1993). Anthropologist Claude Levi-Strauss investigated the myths of ancient cultures and found that they were often used as a means of making sense of the world and explaining it contradictions (Turner, 1993). Meanwhile, personal and oral storytelling has long been studied in linguistics and discourse analysis[1] in order to understand, for instance, how storytellers remember their own experiences or which parts of a narrative are emotionally significant to a storyteller. Some researchers have studied a variety of personal narrative while others have focused on specific types of narratives, for instance, recollections of traumatic events or emotionally difficult stories (Frank, 1995; Mishler, 2006).

Most narratives may be described as consisting of a plot, characters and a setting. And, narratives about past experiences impose a structure on the narrated events so that listeners can make sense of the storyteller's experience (Polanyi, 1989). Often this structure involves an opening, one or more notable events, and an ending providing some resolution (Pridham, 2001). Labov (1972) recorded people telling personal experience narratives in an interview setting and then studied their structure. This resulted in the, now well-established, definition of a personal experience narrative as a sequence of verbal clauses which conveying the narrative events. Furthermore, these narratives

[1] Discourse analysis examines stretches of language, spoken or written, in their full textual, social and psychological context (Cook, 1989).

contain of at least two *narrative clauses* which are told in chronological order and convey the narrative's main event; these make up the so-called *minimal narrative*. Additionally, narratives often contain *free clauses* which tell of general events and background information that set the scene. These are not necessarily told in chronological order; a storyteller might choose a non-chronological order to build tension, surprise listeners or support a particular agenda (Labov, 2010). While Labov's work emphasised the temporal sequence of narrated events, Ricoeur (1980) posited that personal narratives presented an episodic dimension which related narrative events as well as a configurational dimension, or plot, in which storytellers construct meaningful wholes from, potentially, disparate events. So, plot is designed to build towards the narrative's ending and might proceed in such a way that events are not conveyed in a strictly chronological order (Mishler, 2006). Labov (1972) proposed that a narrative's clauses conveyed different narrative elements, each of which can be seen as answering a distinct question. We indicate these elements below along with a description of each and the question they serve to answer:

- ***Abstract:*** Signals the start of and, sometimes, summarises the story. *"What is the story about?"*
- ***Orientation:*** Conveys context and the events leading up to the main event. *"Who, when, where, what?"*
- ***Complicating Action:*** The main event – usually something noteworthy or unexpected and constitutes some kind of disruption to the, up till now, normal events. *"Then what happened?"*
- ***Evaluation:*** Reveals the storyteller's reason for telling the story and usually constitutes some commentary on why the story is interesting or noteworthy. *"So what?"*
- ***Resolution/Result:*** The eventual outcome (the result) and usually, but not always, describes how the disruption presented in the complicating action was resolved. *"What finally happened?"*
- ***Coda:*** Signals the end and might serve as bridge from the resolution/result to the present. *"And what happened then?"*

These elements occur in the order listed, with two possible exceptions: the orientation and evaluation. These usually occur after the abstract and complicating action, respectively, but may also appear throughout a narrative as well. The following (fictional) narrative illustrates Labov's structure:

- *Abstract*: This one time I broke my arm.
- *Orientation*: I was about six years old and it was the weekend. My family always did these outings and we were going to the park. So, I was getting my skates out from under our car. But, my dad didn't see me.
- *Complicating Action*: And, he drove over my arm!
- *Evaluation*: I was so shocked I passed out!
- *Resolution*: My dad immediately gathered me up, put me in the car and rushed me to the hospital. I ended up with a cast for three whole months – all my friends signed it.
- *Coda*: I'll never forget it.

The abstract indicates that the storyteller is about recollect a past experience and, in this example, foreshadows the main event. The orientation sets the scene and the complicating action presents a disruption to the preceding events. The evaluation gives the main point of the story, namely that the storyteller was so shocked by the complicating action event that they passed out. The resolution describes how the disruption is resolved and, in this case, the narratives eventual outcome. The coda signals that the storyteller has concluded the story. Orientation and evaluation clauses may occur throughout the narrative as shown by the following two alternative orderings. The following examples additionally illustrate story events being presented in non-chronological order:

- *Orientation*: I was getting my skates out from under our car.
- *Complicating Action*: And, he drove over my arm!
- *Orientation*: Because, we were all going on this weekend outing to the park. But he didn't see me!
- *Evaluation:* I passed out almost immediately!
- *Orientation:* I was only six years old!

- *Abstract*: This one time I broke my arm.
- *Evaluation*: I passed out!
- *Orientation*: I was about six years old and it was the weekend. My family was going to the park, so I was getting my skates out from under our car. But, my dad didn't see me.
- *Complicating Action*: And, he drove over my arm!
- *Evaluation*: Like I said, I passed out – you know, I was so shocked!

At the very least a narrative should contain a complicating action and evaluation; these constitute the minimal narrative described earlier. The abstract, orientation and result/resolution flesh the narrative out. In the above example, the complicating action and evaluation would be enough to convey the essence of the story:

- *Complicating Action*: My dad drove over my arm!
- *Evaluation*: I was so shocked I passed out!

As mentioned earlier the orientation provides contextual information and relates the events leading up the complicating action. Labov describes this as the *narrative preconstruction*: a series of mundane events leading up to one or more *triggering events* that precipitates the complicating action (Labov, 2010). In our example narrative, the mundane events include of the storyteller's family being on their way to the park and the storyteller fetching their skates. The triggering event is "But, my dad didn't see me" which leads to the complicating action. Norrick (2000) analysed storytelling during spontaneous conversation and suggests that orientations convey three types of information: *general frame* clauses give the narrative's time and place; *background information* conveys a variety of details that set the scene, but may not lead directly to the point of the narrative; and *narrow frame*, which are analogous to triggering events. In our example, the orientation might be classified as:

- General Frame: I was about six years old and it was the weekend.
- Background Information: My family always did these outings when I was little, and we were going to the park.
- Narrow Frame: So I was getting my skates out from under our car. But, my dad didn't see me.

Martin & Plum (1997) built upon Labov's work analysing the structure of 134 personal narratives elicited in interviews. They found that the Complicating Action – Evaluation – Resolution part of Labov's structure only applied satisfactorily to 15% of these. Noting the ways in which this part of the personal narratives' structure deviated from Labov's, led to the identification of three distinct genres of personal experience narratives which were distinguishable from each other based on the function and structure of the evaluation and resolution; elements that may not occur are indicated in brackets:

- **R*ecounts*** are exact descriptions of events akin to a courtroom testimony, and are structured: *(Orientation) - Record of Events - (Reorientation)*.
- ***Anecdotes*** convey emotional and/or humorous aspects of an experience, and are structured: *(Orientation) - Remarkable Event - Reaction - (Coda)*. The example narrative used in this section is an anecdote since it serves to convey the storyteller's shock.
- ***Exempla*** convey an opinion or judgment on the narrative's events, and are structured: *(Orientation) - Incident - Interpretation - Resolution - (Coda)*. These are usually associated with moralising story genres such as parables. Our example narrative would have been an exemplum if it concluded "And that's why you never, ever reach your arm under a car unless you're sure no-one's driving!".

While the three genres differ in their content and ultimate aim, their structures are, still, quite similar to Labov's more generalised structure. Recounts differ most since they feature no complicating action or crisis. Instead, recounts convey a number of events, which might conclude with a *reorientation* wherein the storyteller describes how the recounted events changed the state of affairs described in the orientation. Anecdotes and exempla differ from Labov's structure in two ways. First, the naming and content of the narratives clauses: the *remarkable event* and *incident* elements of anecdotes and exempla map to the *complicating action*. The *interpretation* in exempla, where the storyteller, describes their judgment of the story events maps to the Labovian *evaluation*. Second, in anecdotes, the Labovian *evaluation* and *result* are merged to form the *reaction,* which describes the storyteller's reaction to the narrative's remarkable event.

In Labov's and Martin & Plum's work, most often the narratives studied are elicited in interviews. Later work, studied personal experience narratives told during spontaneous conversation. For instance, Ochs & Capps (2001) focused on social interactions where stories arose naturally and rather than "polished narrative performances". We have already mentioned Norrick, who explored the structure of both elicited and conversational narratives. He generally found the structures and genres they proposed by Labov held but refined the structure of the orientation. He also found that oral narratives sometimes featured digressions from the main plot line which featured their own internal, Labovian structure (Norrick, 2000). We used the structures and genres described in this

section, as well findings regarding conversational storytelling, as a basis from which to analyse the personal experience narratives of District Six ex-residents.

Of course, the narrative genres described in this section are not the only way of understanding of classifying personal experience narratives. In his work on the narratives of storytellers afflicted with illness, Frank (1995) reports three narrative types within this subset of personal storytelling. The restitution narrative starts with the storyteller being healthy, becoming ill, but believing they will healthy in the future. The chaos narrative's storyteller imagines never being healed; this type is marked by chaos – an absence of narrative order to the extent that it may be described as an anti-narrative. Finally, the quest narrative in which storytellers not only accept their illness but use it as a jumping-off point for a hero's journey. Furthermore, the type of narrative reveals the storyteller's perspective on their illness.

2.2.2. Retelling Stories

A hallmark of oral storytelling is that narratives endure by being retold many times over. Consequently, narratives vary across retellings ranging from slight variations to situations where the audience might be considered co-storytellers (Bauman, 1986; Ochs & Capps, 2001). Bakhtin's theory of dialogics proposed that *all* spoken discourse, including oral storytelling, was shaped by the audience[2] and the context in which they occurred (Bakhtin, 1986). The implication of retelling narratives for oral histories is that narratives may change over time (especially when told by different storytellers) as a result of different social contexts and agendas (Portelli, 1991). The changes in oral histories over time is, of course, a problem that is difficult to simulate in digital storytelling as these variations typically occur over time and in response to current events, norms and concerns. Numerous linguists have examined the structure of oral narrative retellings by the *same* storyteller to different audiences with different time intervals between retellings. These analyses aimed to understand how storytellers construe past experiences by noting what stays constant and what varies across retellings (Chafe, 1998; Norrick, 2000). One study compared two retellings of the same narrative told to different audiences fifteen weeks apart in order to gain insight into the storyteller's memory and reconstruction of past experience. The comparison revealed that audiences played a role in shaping the narrative's progression and the storyteller would expand or shorten particular parts when retelling the narrative. However, the underlying plot and foci remained the same and, often, phrasing was repeated verbatim (Chafe, 1998). Norrick (2000) found that narrative structure remained quite stable over different retellings with significant consistency in the sequencing of clauses and the content of the evaluation and orientation. Like Chafe, he identified "familiarity through frequent retelling" is big determinant of how similar the phrasing used in different retellings was, with parts of narratives often being reproduced verbatim. He further suggests that storytellers tailor a basic story somewhat for a current audience and/or context without reconstructing it entirely. As we will describe in Chapter 4, these findings allowed us to understand the storytelling of ex-resident guides at the District Six Museum, who told their stories multiple times daily.

[2] The theory of dialogism holds that even if there is no audience present, the speaker themselves serves as the audience or directs their speech at an imagined audience.

2.3. Interactions between Speakers and Listeners

The previous section described findings about how spoken narratives vary across different retellings. Another, related, hallmark of oral storytelling is that storytellers and listeners interact with each other – something we hoped to simulate in our work. Human-computer interaction researchers have encouraged the design of interactions that are as human-like as possible. Dourish (2001) describes embodiment, a design approach which allows users to establish a technology's meaning by interacting with it and designing in way that capitalises of familiar social interactions and skills. While creating completely natural, and robust, human-computer interactions a challenge, it is quite possible for restricted domains of discourse where interaction patterns are well understood (Hayes & Reddy, 1983; Suchman, 2007). Suchman (2007) further suggests that linguistic studies in human conversation offers lessons for how human-computer interaction can be made more intuitive and effective. We hoped that a deep understanding of personal oral storytelling, involving a storyteller and a group of listeners, would offer design ideas for naturally interactive digital storytelling. Dautenhahn (1998) provides a useful categorisation scheme for rating the intelligence and interactivity of digital storytellers. Type 0 describes an agent who tells a single narrative without variation or reaction to users. Our own previous work involved building such agents to tell a single indigenous folktale (Brown, et al., 2003; Ladeira & Blake, 2004; Marsden, et al., 2010). Type I agents tell multiple stories, but without any interactivity or variation across retellings. The robot guide described earlier might be described as Type 0 or I since it delivered static content delivered and, although it mimicked interaction with museum visitors, it did not *listen* to user's input and adapt response based on that input. Type II agents are capable interaction with a large variety of responses to users. However, while they may appear believably human-like, (like, for instance, the famous artificial intelligence system ELIZA (Weizenbaum, 1966), they typically draw from a pre-specified collection of responses). Type III agents tell, listen to and understand narratives using artificial intelligence techniques to adapt them own narratives based on user's inputs and narratives. Finally, Type IV describes autobiographical agents which are capable of telling stories the way humans do – compellingly and in a way that changes over time based on personality and circumstances. This agent is one whose narrative repertoire would change over time in the way described by Bakhtin and Portelli earlier. Towards the goal of designing "graceful" interactions, Suchman advocates for practical systems which can parse limited sets of input and are able to deal with unexpected inputs. This suggests that striving to create Dautenhahn's Type II agent is realistic and worthwhile goal.

Suchman further suggests that computer applications' ability to respond immediately to user inputs have facilitated increasingly linguistic interactions. Here we briefly review three branches of linguistics work and discourse analysis on speaker-listener interactions in storytelling and conversation settings, complete with strategies for dealing with unexpected 'inputs'. First, interactions found in oral storytelling involving one storyteller speaking to a group of listeners. Second, conversations and conversational storytelling involving a group where the roles of speaker and listener(s) are change constantly. Third, interactions which occur between a teacher and students during lessons.

Livo & Reitz (1986) describe a number of ways in which oral storytellers interact with audiences. *Ritual participation* is a structured device, mostly used with audiences of young children, which takes the form of chants or songs in which a storyteller invites the audience to participate. *Coactive participation* describes spontaneous, unsolicited reactions from audiences, such as gasps, repeating

the storyteller words, mouthing along with the storyteller and gestures. These reactions serve to indicate that audiences are engaged and open to interacting with the storyteller. *Banter* involves dialogue between the storyteller and audience. The storyteller may make editorial comments about a narrative in response to an audience's spontaneous comments or reactions. *Questioning* is a form of banter initiated by the storyteller asking the audience questions related to the narrative.

Although one might not intuitively equate conversation and storytelling, a great deal of conversation consists of speakers telling personal experience narratives (Sacks, 1992; Ochs & Capps, 2001). The study of conversation offers much in the way of understanding real-life interactivity since it is naturally dynamic and interactive – the roles of speaker and listeners change constantly during a moment-to-moment management of turns to speak (Sacks, et al., 1974). This process is, intuitively, governed and assisted by a number of rules and methods such as discourse markers, turn-taking and adjacency pairs. Discourse markers are words which indicate openings, closures and links between different parts of a conversation. For instance, words like "And", "But", "Oh", "So", "Well", "Right", "You know" and "Anyway" are commonly used to indicate that a speaker is closing off a point or starting a new one. Whilst, words such as "If" and "Because" are often used to link ideas together (Pridham, 2001). Sacks et. al. (1974) studied and described *turn-taking* – the process that governs whose turn it is to speak. The person currently speaking is described as 'having the floor'; turn-taking rules indicate how to obtain, hold and give up the floor. The person who has the floor has the most right to it and can continue speaking as long as they want. A central principle in the back-and-forth of a conversation is avoiding gaps or overlaps in speaking. *Turn constructional units* (TCU) are stretches of speech where another person, ordinarily, should *not* start speaking. Upon a TCU's completion, however, there is a *transition relevance place* (TRP), where it *is* possible for another person to speak. TRP's most commonly take the form of a simple pause in speech. Speakers with the floor may also signal a willingness to give up the floor by directing their gaze towards a next speaker, accompanying their final words with a gesture, a discourse marker or asking the other person/people for suggestions or posing a question. They might even select a next speaker directly. If the current speaker does not direct the selection of a next speaker, someone may select themselves by reading signals from the flow of speech that suggest a forthcoming opening. Should no one seize the opportunity to speak during a TRP, the current speaker may continue. Furthermore, speakers who want to keep their turn may *avoid* pausing at the end of sentences, making sentences run on by using connectors such as "like", "and", "then", "but" and "so", or placing pauses at places where the message (or current TCU) seems incomplete (Sacks, et al., 1974). Interrupting a current speaker, or *turn stealing*, is not considered good behaviour, as is silence when a response is expected (Pridham, 2001). Regarding conversational narratives, Ochs and Capps (2001) note that where a group is "co-telling" a narrative[3] speaker's turns tend to be short. And, if there is one main storyteller, they tend to take up the floor for an extended amount of time to tell a narrative. It was this latter kind storytelling we wanted to focus on.

A device often used to establish a connection with a group of listeners is the posing of a question. *Tag questions*, are short one or two word questions at the end of statement, for example "right?" or "hey?", used to 'touch base' with an audience to obtain some indication that the speaker and listener(s) share a mutual view of things or that listeners are paying attention. (Pridham, 2001)

[3] This typically occurs where two or more of the speakers are familiar with a narrative.

Earlier we mentioned that posing a question is a device by which storytellers may initiate banter and that a speaker in conversation may influence who speaks next (Livo & Rietz, 1986; Sacks, et al., 1974). Question-answer interactions exemplify *adjacency pairs* or *initiation-response pairs* – dialogue pairings that usually occur together and provide much of conversation's predictable nature (Pridham, 2001; Schegloff, 2007). For instance, when one asks "How are you?" the most expected response is "Fine. Thank You" or "Fine. How are you?". Similarly, specialised interactions usually feature normative, pre-allocated turn-taking. For instance, during lessons teachers and students make used of well-understood, specific turn-taking patterns. A major influence in our work was the in-depth discourse analyses of teacher-student interactions conducted by Sinclair & Coulthard (1975). They found that, during classroom lessons, teachers hold the floor most of the time while students contribute when specifically allowed. An interaction pattern often observed in this setting are *exchanges*, or *exchange structures*, wherein a teacher poses a question which students are encouraged to answer. This is done to test students' knowledge or grasp of the lesson or to allow them to give their perspectives and teachers almost always know the question's answer(s). Very simply, exchange structures may be described as type of *adjacency triplet* consisting of: the teacher's *initiation*; student(s) *response(s)*; and the teacher's *feedback*. (Sinclair & Coulthard, 1975; Pridham, 2001) Sinclair & Coulthard identified four variations on this basic pattern each fulfilling different functions: informing; directing; checking; and eliciting. Earlier we mentioned that an exchange may lead to some back-and-forth banter between teacher and student(s). When one exchange leads to another, the second exchange is termed a *bound exchange* (since it is bound to the preceding exchange). The four exchange patterns are described below using Sinclair and Coulthard's notation: *I* (initiation); *R* (response); *F* (feedback); I^b (initiation of a bound exchange). Placing any of these in rounded brackets indicates that they may not necessarily occur:

1. ***Teacher Inform I (R)****:* the teacher conveys facts, opinions, and ideas during *I;* students might respond verbally *(R)* and there is there is no feedback from the teacher.

2. ***Teacher Direct I R (F)****:* the teacher directs students to *do* something during *I* leading to response *R*. This may be followed by teacher feedback *F*. In the event that students do not respond to the initiation, the teacher may employ additional encouragement to obtain a response, resulting in: ***Reinforce I R*** $\boldsymbol{I^b}$ ***R***, where I^b is a second initiation that may take the form of a clue, prompt or nominating of a particular student.

3. ***Check I R (F)****:* the teacher checks if students are paying attention and following the lesson. This exchange is most likely initiated by a tag question and feedback to student's responses is not essential.

4. ***Teacher Elicit I R F****:* similar to *teacher direct*, but designed to obtain verbal contributions from students and often leads to a series of *I R F* interactions to move a class toward a conclusion. Typically the teacher asks questions during *I* to which one or more students responds during *R*. The teacher might choose a specific a student to reply or students might raise their hands or verbally bid to give replies. Teachers often instruct those who want to answer to raise a hand. Feedback, *F*, usually entails accepting and judging an answer. In most cases it is comprised of an *accept* confirming that the teacher has heard a response (e.g.

"yes", "no", "fine", "good"), leading to an *evaluation*[4], where the answer is either declared right or wrong. This exchange may play out in a number of different ways, depending on how students react:

i. ***Repeat***: If a student doesn't hear the initiation, the teacher may repeat it leading to the following pattern: ***I R I^b R F***. There is no feedback after the first student response; rather the teacher repeats the question in I^b.

ii. ***Re-initiation****:* If the teacher's initiation gets no response, they may re-initiate the exchange by restating or rephrasing the question resulting in ***I R I^b R F***, where I^b represents the re-initiation. Ideally, students then respond to the restarted exchange leading to teacher feedback.

iii. ***Re-initiation****:* If a student provides an incorrect answer, the teacher gives feedback and may re-initiate the exchange to obtain more responses: ***I R F (I^b) R F***. Note the re-initiation is optional – the teacher may simply give a negative evaluation of the answer in their feedback and then wait for another answer attempt. If the re-initiation does occur it may take the form rephrasing the question, giving clues for the correct answer or prompting for more answers e.g. "come on", "try again". This process may repeat allowing the teacher to iteratively guide the class towards the correct answer(s).

iv. ***Listing****:* Sometimes a teacher withholds the exchange's evaluation until two or three answers have been given. They may want to ensure that numerous students know the answer or the question may have multiple possible answers. Feedback after the student's responses consists simply of listing the answers given so far resulting in: ***I R F (I^b) R F (I^b) R F***. Here, I^b consists of prompting for more answers and the final *F* gives students feedback on their answers and the exchange's overall evaluation.

Finally, Sinclair and Coulthard also identified two kinds of student-initiated exchanges:

i. ***Pupil Elicit I R*****:** a student asks the teacher a question (usually, but not necessarily, related to the lesson). To speak students must first obtain the teacher's attention and permission. A major difference between this and the teacher elicit exchange is that the student, typically, provides no feedback on the teacher's response.

ii. ***Pupil Inform I F****:* a student offers up information and teachers usually respond by providing an evaluation and/or a comment on the student's contribution.

[4] Not to be confused with the Labovian narrative evaluation discussed in the previous section; the similarity in terms is coincidental.

2.4. Understanding and Simulating Museum Guides & Tutors

Significant previous work has pursued understanding and simulating certain human interactions. In this section we consider two particular branches that are especially relevant to our project: the interactions museum guides and visitors and between tutors and students. It is generally accepted that both of these are plays the roles of experts who guide audiences in learning experience. Museum guides usually augment museum visitors' experience and appreciation of a museum's exhibits and stories, while human tutors teach and scaffold students' learning.

Museum guides are usually thought of as sources of non-narrative information – for instance describing paintings in art museums or explaining a series of fossil discoveries in a natural history museum. However, museum guides often incorporate narratives in tours to give visitors more relatable, engaging experiences. For instance, in addition to describing a painting style or fossil discoveries, they might tell stories about the artists or palaeontologists involved. Furthermore, stories of personal experience are a compelling way to learn about historical events (Maynes, et al., 2008), especially when told by those who lived them first-hand.

In the social sciences, museums guides, and their storytelling, have been studied qualitatively in order to understand how they shape visitor's experience of a museum's discourse and exhibits. Katriel (1997) conducted an extensive ethnography of guides in two Israeli settlement museums focusing on narratives about the establishment of kibbutzim. This work was particularly interesting to us as it discussed the narrative performances of "old-timer guides" who were, themselves, kibbutz pioneers, and second-generation kibbutz guides, who did not experience kibbutzim establishment. It also offered insight into such museums as settings which combine "the imaginative thrust of verbal expositions and narratives with the concreteness (and) authenticity" of the object displays. The objects selected in these museums were essentially removed from their natural contexts in order to be placed in the public eye and to tell particular stories. Furthermore, the guides were aware that their role included offering contextualisation in relation to such objects. Cohen (1985) describes a modern tourist guide as being a pathfinder, who leads visitors on a route through an unfamiliar space while selecting, describing and interpreting objects along the way. The guides in Katriel's study alternated between giving "standardised factual information" about the objects with "narrative segments"; the latter giving insight into the *experience* of kibbutz establishment. She classified these narratives into two types: object narratives about the past uses of objects on display and frame narratives about the creation of the museum and its exhibits. Old-timer guides frequently told frame narratives and gave strongly autobiographical tours featuring first-person narration and "testimonial rhetoric". Meanwhile, second-generation guides, who had inherited these testimonial accounts, could not fully adopt the first-person narration style. Finally Katriel observed that the museums were visited by school classes guides tended to take on the role of a teacher-guide.

In virtual storytelling and human-computer studies, there have been a few attempts to study museum and tour guides for the purposes designing digital guides. These studies have taken the form of brief surveys of specific behaviours or interaction patterns. But, no previous work has undertaken a thorough ethnographic study of museum guides, or personal storytelling for that matter. In general, work on digital museum and tour guides has focused on delivering context-sensitive information about exhibits or locations, rather than narratives. The simulation of guide-visitor interaction has been relatively limited, and, where explored, has focused on refining content

delivery based on user's interests. Most digital museum guide applications are deployed on mobile devices, such as a cellular phone or a personal hand-held device, which visitors can carry around an exhibition space. Some of these use RFID tagged exhibits (van Hage, et al., 2010) or track user locations to deliver context-sensitive information (Abowd, et al., 1997; Ghiani, et al., 2009).

Mobile tours guides taken of the form of audio voices and animated avatars (Moraes, et al., 1999; Lim & Aylett, 2007). Yamazaki et al. sought to create a robot capable of simulating guide-visitor interactions in an art museum. They studied non-verbal behaviours in fifteen videotaped instances of museum guides explaining paintings to visitors. (Yamazaki, et al., 2008; Yamazaki, et al., 2009) They found that guides' gaze and gestures were coordinated around transition relevance places (TRPs), a concept from conversation research used to describe when one speaker pauses creating a space in which another person to speak (we present our own discussion of TRPs in Section 2.3) (Sacks, et al., 1974). For example, when a guide would finish speaking, they would change the direction of their gaze from a painting to the audience. Additionally, they found that guides would attempt to involve visitors by asking questions either relating to visitors' previous knowledge or a painting's features. Asking questions was often accompanied by specific gaze behaviours. And, guides dealt with incorrect answers by drawing on their knowledge base. Using these observations, they built a robot capable of detecting human faces so as to direct its "gaze" in appropriate directions, and responding to visitors to a limited degree. The robot guide periodically asked "involvement questions" about a painting after which it would pause for a pre-set amount of time, allowing time for visitors to respond, before delivering the correct answer. However, the robots final responses were pre-set and they did not parse any of the visitor's answers, serving rather to create the illusion of interaction. At the Ohara Museum of Arts, 83% of visitors who encountered the robot listened to a complete explanation. Of these, half responded, when the robot changed the direction of its gaze. Furthermore, a large proportion of visitors responded to the involvement questions and they, overall, led to more engagement with the robot and painting under discussion. The robot did have some limitations: since it did not parse visitor's answers, it was unable to respond to incorrect answers appropriately.

Most computer science work on simulating museum guides has focused on delivering expositional information, while only a handful has explored simulating storytelling. Lim & Aylett conducted a brief survey of tour guides' storytelling to aid the design of mobile tour guides who tell stories. They report that guides: incorporate their own and other's perspectives and past experiences into tours; different personalities and presentation styles influence tour content; welcome interactions as indicators of visitor's interest; and adjust narrative type and detail level according to visitor demographics. Their design focused mainly on mobile tour guides with distinct 'personalities', which influenced the narratives told (Lim, et al., 2005; Lim & Aylett, 2007). Lim & Aylett's survey findings helped to inform our work. But, rather than focus on simulating personalities, we aimed to capture the storytelling and personalities of specific real-life guides.

Just as there is a desire to simulate human museum guides, work on intelligent tutoring agents also seeks to simulate human tutoring and, in so doing, achieve the learning effects associated with it. Previous work on intelligent tutoring agents capable of interacting conversationally with users has drawn from linguistic knowledge of conversation and discourse analyses of human tutors. The goal is typically to create flexible, natural dialogue between an agent and student(s) which scaffolds their

learning (Kumar & Rosé , 2011). Furthermore, the use of conversational tutor agents has yielded strong learning gains (Graesser, et al., 2005; Arnott, et al., 2008). In order to produce effective conversational interactions, researchers have studied naturalistic human tutoring dialogue to discover understand which interactions support learning (Rosé & VanLehn, 2005). One example, AutoTutor, was based on in-depth discourse analyses of approximately 100 hours of real tutoring sessions (Graesser, et al., 1999). The resultant system implements one-on-one interactions, between a talking head tutor agent and user, during which the tutor presents the user with a series of questions or problems and assists in the construction of an answer over numerous (50-200) conversational turns. During these interactions AutoTutor prompts the user for more inputs if their answers are incomplete, prompts the user to fill in missing words, gives hints, corrects and supplements incorrect inputs, answers user questions that arise and summarises answers once an interaction is complete (Graesser, et al., 2005). These interactions share similarities with those described by Sinclair & Coulthard (1975), but were based on constructivist learning theories and focus on lengthy one-on-one interactions. Rosé et. al. (2003; 2005) analysed typed interactions, via online chat, between seven students and tutors working on producing essay answers to physics problems. They paid particular attention to the types of questions tutors asked while steering students towards correct answers and the feedback given to student responses. They found that tutors made use of open-ended questions and negative feedback to encourage discussion. Furthermore, they tended to respond to incorrect answers by offering further guiding instruction and negative feedback including pointing out student's mistakes, making corrections or ignoring a student's answer by rephrasing or repeating the question. Furthermore, the study of natural language has allowed the development of sophisticated language technology for parsing and responding to user input in natural and useful ways. While it is difficult to achieve a human tutor's ability to interpret student's speech and tailor their responses, strong gains have been made in language understanding technology used in tutoring systems (Graesser, et al., 1999; Rosé & VanLehn, 2005; Kumar & Rosé , 2011). Some systems have successfully used a "bag of words" approach in which user's answers are compared to a set of words in a desired model answer while giving greater weight to words which appear more often in the latter (Graesser, et al., 2000). Meanwhile, Rose & VanLehn (2005) describe the use of a text classification system which combines the "bag of words" approach with deeper syntactic sentence analysis in order to assess the correctness of student inputs and identify knowledge gaps and misconceptions. They demonstrate a significant reduction in error rate over using the "bag of words" approach alone.

Tutoring dialog has been modelled using finite state machines in which, at any point, in a dialogue, the system in a particular state which expects a number of possible responses from a user(s) and the user's input determines the system's transition to a new state (Rosé, et al., 2003; Bohus & Rudnicky, 2009). Finite state machines are, theoretically, capable of representing any possible interaction, but in practice this approach is best for short and simple interactions, such as the *I R F* exchanges described in the previous section (Bohus & Rudnicky, 2009). Longer dialogue featuring multiple conversational turns make use of plan-based approaches in which tutor agents determine a sequence of steps, or path, required to reach a conversational goal(s) such as ensuring the user demonstrates an understanding of a particular topic or is able to solve a particular type of problem (Freedman, 2000; Bohus & Rudnicky, 2009).

Other work has explored collaborative learning environments with multiple users where a tutor agent participates in, but does not control the floor. Facilitating such group interaction requires supporting uneven turn-taking (for instance a tutor agent might have to be "silent" while users interact with each other) and resolving ambiguities regarding the intended recipient of users' inputs (Kumar & Rosé , 2011). Rosé et. al. (2011) describe a tutor agent architecture, Basilica, which integrates tutoring scripts which follow the *I R F* pattern where an initiation question is presented and user responses are matched to appropriate feedback which may include a number remedial steps giving feedback to incorrect inputs intended to ultimately lead users to a correct response. This pattern includes the strategies described earlier for dealing with receiving no relevant responses, such as repeating a question, repeated prompting for responses and giving hints. They, additionally, explored tutors capable of maintaining a history of past interactions steps and implemented socio-emotional interactions such as giving reassurance, small talk, complementing user's feedback, expressing enthusiasm and cheerfulness. Evaluations showed that the socio-emotional interactions resulted in marginal learning gains and significant improvements in user's attitude toward the tutor agents.

2.5. Summary

We reviewed previous work and ideas that influenced our approach to digital storytelling design for preserving personal experience narratives. We discussed digital and virtual storytelling. The former has typically explored preserving real-life narratives with some work focusing on providing, often multi-media, tools for users to express their own stories while others focus on creating narrative archives. In general, digital narratives are static (the same each time a user experiences them) and non-interactive. On the other hand, virtual storytelling often focuses on fictional narratives or dramas where users influence or author narratives to varying degrees. We view our work as an intersection of these two fields since we wanted to explore dynamic, interactive ways to present personal experience narratives without altering their content. We discussed well-established linguistics and discourse analysis work on the structure and genres of personal experience narratives the interactions that occur in oral storytelling, conversations and in classrooms. Narratives may be viewed as a sequence of ordered *clauses* through which a storyteller presents their perspective of personally experienced events. Storytellers interact with audiences in a number of ways including: *ritual* and *co-active participation, banter* and *questioning*. In conversation, the roles of speaker and listener(s) change constantly; this process is governed and assisted by intuitive *turn-taking* rules. We presented work on teacher-student interactions during classroom lessons, in particular *exchange structure* patterns. Finally, we reviewed existing work on understanding and simulating how museum guides and tutors interact with audiences.

The ideas discussed in this chapter formed a basis from which we tackled the problem of preserving spoken personal experience narratives. The structure of personal experience narratives described by Labov and Martin & Plum, and the interaction patterns described by Sinclair & Coulthard were instrumental in, first, understanding real-life storytelling and storyteller-audience interactions and, second, designing effective user-storyteller agent interactions that builds upon previous work and ideas used in designing compelling museum guides and tutoring agents. In the next chapter, we describe the starting point of our own work – an ethnographic study of real-life storytelling.

Chapter 3

Study One: Ethnography of Real-Life Storytelling

This chapter describes the first phase of our work in which we studied real-life personal storytelling thoroughly as a means of gathering design ideas for a dynamic and interactive digital storytelling design. In Section 3.1, we describe our how our early conversations with the District Six Museum led to this project's first research questions. Section 3.2 describes Study One, our ethnography of ex-residents' storytelling at the museum. The remainder of this chapter gives contextual information about the museum itself (Section 3.3) and the ex-residents we interacted with and tours observed (Section 3.4).

3.1 Choosing to Study Real-Life Storytelling

We embarked on this project with the broad goal of exploring novel ways to make digital storytelling dynamic and interactive. At the same time, the District Six Museum was interested in exploring effective ways to preserve and disseminate former District Six residents' narratives. Dialogue with the museum's management and curators directed our research goals such that they addressed the museum's interests. The museum defines itself as a "community museum" that strives to have their exhibits and events stem from an involvement with the community of District Six "ex-residents" and their families and friends – in short, anyone affected by District Six forced removal. The museum was also often described as a "space of memory" which prioritises ex-residents' narratives. The curators strove to allow different perspectives on District Six and forced removals to co-exist, thus avoiding a canonical District Six narrative and encouraging a "layering of different voices" from the community.

Two of the museum's concerns stood out to us. First, they did not have any interactive exhibits involving technology, but were eager to include more these, if unsure of how to go about it. The only exhibits which involved technology were themed sets of objects, pictures and texts accompanied by audio recordings, of ex-residents telling stories, playing music and reading poems or book excerpts, which played autonomously on a loop. Second was their emphasis on live oral storytelling and interaction with ex-residents. Special occasions were often arranged to gather ex-residents for reunions or where ex-residents gave book readings, talks, told stories or played music. Two ex-residents, Joe Schaffers and Noor Ebrahim, worked as full-time museum guides, telling stories about their experiences. Museum management felt that interacting with ex-residents was the most compelling way to convey the history of District Six. This approach is used in many museums, but is only possible where people with living memory, are available. For example, the popular Robben Island Museum[5] offers tours led by former prisoners and the Israeli settlement museum in Katriel's

[5] Robben Island, off Cape Town's coast, is where Nelson Mandela, and many other anti-Apartheid activists were imprisoned. The prison is now a popular museum.

work employed founding kibbutz members as guides (Katriel, 1997). The perspectives of those who experienced the events and/or objects memorialized in these museums offers narrators who are themselves part of that history and whose narrative repertoires provide, what Katriel refers to as, testimonial rhetoric grounded in their personal history. Unfortunately, the community of District Six ex-residents is aging and the museum was concerned about how to best preserve not only their narratives, but the way they told these – their *storytelling*. At the time of this project they were faced with the reality that when Joe and Noor depart, there will be no way for visitors to interact with ex-residents and experience their "testimonial rhetoric" first-hand. Hence, they wanted to explore innovative ways of preserving such narratives while remaining faithful to their ethos of live oral storytelling in the museum space. Cultural heritage experts and historians recognize the resonance of personal experience narratives for conveying history. The District Six Museum's interest in preserving ex-resident's narratives exemplifies the well-known problem of trying to preserve personal narratives before they are lost.

Thus, our overarching aim was to design and test ideas for digital storytelling that would achieve the goal of effectively delivering ex-residents' personal narratives in a way that emulated their storytelling. We hoped to go beyond the static video and audio recording of narratives common in digital storytelling to give listeners a sense that they were experiencing a narrative told in person, by an ex-resident. He hoped that our eventual design would allow personal narratives to vary for different users and allow interaction between user and digital storytelling. At the same time, since these narratives told of real experiences, we wanted to design dynamic, interactive digital storytelling *without* losing the storyteller's voice. Our first step toward this goal was to gain an understanding of the storytelling we were seeking to simulate. Much existing work on digital storytelling looks to previous work or storytelling literature for new design ideas. But, we had not encountered any work that draws from real-life oral storytelling. We focused our exploration of how personal experience narratives are told according to the following two research questions:

1. *What kinds of narratives are used to convey personal experience of historical events?*

2. *What techniques are used in oral storytelling to make personal narratives (a) dynamic and (b) interactive?*

We specifically chose to begin by answering only these research questions (as opposed to a complete set of questions) so that our work could be shaped by the storytelling we wanted to preserve. First, we felt it was important to understand what kinds of narratives were used to convey personal experience in a particular historical context, such as Apartheid. Secondly, we were interested in gathering ideas that would allow us to design digital storytelling that went beyond a static recording on of a narrative. Two well-known key characteristics of oral storytelling is that narrative content may change each time a story is retold to a new audience and that audiences may interact with a storyteller (Livo & Rietz, 1986; Bauman, 1986; Portelli, 1991; Norrick, 2000; Ochs & Capps, 2001). Additionally, the dynamism and interactivity of oral storytelling are linked, that is variations in narrative delivery may be brought about through storyteller-listener interactions (Bauman, 1986; Norrick, 2000). Given the importance the museum placed on Joe and Noor's storytelling, and their availability at the museum, we chose primarily to study their storytelling. We were especially interested in seeing how dynamism and interactivity were incorporated into personal narratives without affecting, or disturbing, the narrative progression or content.

3.2 Ethnographic Study

To answer the research questions described in the previous section, we conducted an in-depth ethnographic study of ex-residents' storytelling at the District Six museum, focusing on Joe and Noor. Most ethnographic studies in system design aim to understand end-users and contexts of system use, and they tend to take the form of short focused studies (Monk, et al., 1993; Hughes, et al., 1994; Hughes, et al., 1995). However, traditional ethnographic studies involve significant amounts of fieldwork and produce rich, contextualised, qualitative descriptions of a studied setting (Fetterman, 1998). Applying this data to system design in a useful way is challenging (Iqbal, et al., 2005). Nonetheless, we hoped a thorough ethnography of the ex-resident's tours would allow us insight into real-life personal storytelling. And while, the museum was a potential setting for the digital storytelling system we wanted to design, our ethnography was aimed at drawing design inspiration for digital storytelling.

Museum management required that we write a research proposal for Study One to ensure that the research outcomes were mutually beneficial and we followed their ethics guidelines for conducting research with ex-residents. Upon its approval, a contract between the museum and main researcher was signed. It stipulated that the museum would provide contextual information where needed and the researcher would acknowledge the museum and ex-residents on all research outputs.

Study One began with museum management introducing the main researcher to Joe and Noor individually. Each briefly described the content they tended to deliver during tours, the types of organised visitor groups they preferred to handle and some of their background. The main researcher explained that aim of the study was to observe storytelling during their tours unobtrusively. We made sure to explain that our goal was not to evaluate their storytelling critically, but rather to learn from them. We met another ex-resident, Menisha Collins, who also worked full-time at the museum. In previous years Menisha had managed the museum's coffee shop, but now worked daily, in the museum's main hall embroidering memory cloths (which are described in the next section). While she did not lead tours, she sometimes interacted with museum visitors and, thus, we made a point of spending time with her and observing these interactions when possible.

Our investigation took place over three months with three to four field visits per week where we observed as many tours as possible. This time-frame allowed us to become well acquainted with Joe and Noor's narrative repertoires and storytelling styles and allowed us to observe numerous retellings of the same narratives. When multiple tours were taking place simultaneously, we selected one tour to focus on. During times when no tours were taking place, the main researcher spent time in the museum's mail hall either engaged in informal conversation with Joe and Noor, observing the movements of unguided visitors or embroidering memory cloths with Menisha. We observed thirty-nine complete tours; during each we took detailed field notes on what we made the storytelling compelling, dynamic and interactive. We also noted guides' movements and gestures, the museum locations and objects referenced during narratives and contextual information about visitor groups (such as ages and amount to time spent in the museum). Special arrangement was made to record seven tours via lapel microphone, three led by Noor, four by Joe; these were later transcribed.

3.3 The District Six Museum

The museum is housed in a former Methodist church on the outskirts of the former District Six suburb of Cape Town. It is a relatively small museum which consists of two levels. As visitors enter they encounter the main hall facing a pulpit and choir stands. The church's piano remains at the front of the hall and is often used for concerts in the museum and impromptu sing-alongs. One of the first exhibits most visitors notice upon entering the museum is a hand drawn, aerial view map of District Six which covers almost the entire floor (see Figure 3.1 below). On it, ex-residents have written their names on the locations where they used to live. Embroidered banners, made by ex-residents, cover the pulpit and choir stands; they depict various sports clubs, schools and societies that existed in District Six. In front of the banners is the museum's very first exhibit, *Streets*: a chain-linked tower consisting of the original street name signs from District Six. In 1994, after South Africa's first democratic election, a committee of ex-residents and friends of District Six created *Streets* as a temporary exhibit in the then-empty Methodist church building. The overwhelming popularity of the exhibit itself and the having a space for ex-residents to gather became the catalyst for more exhibits there, eventually leading to a permanent museum.

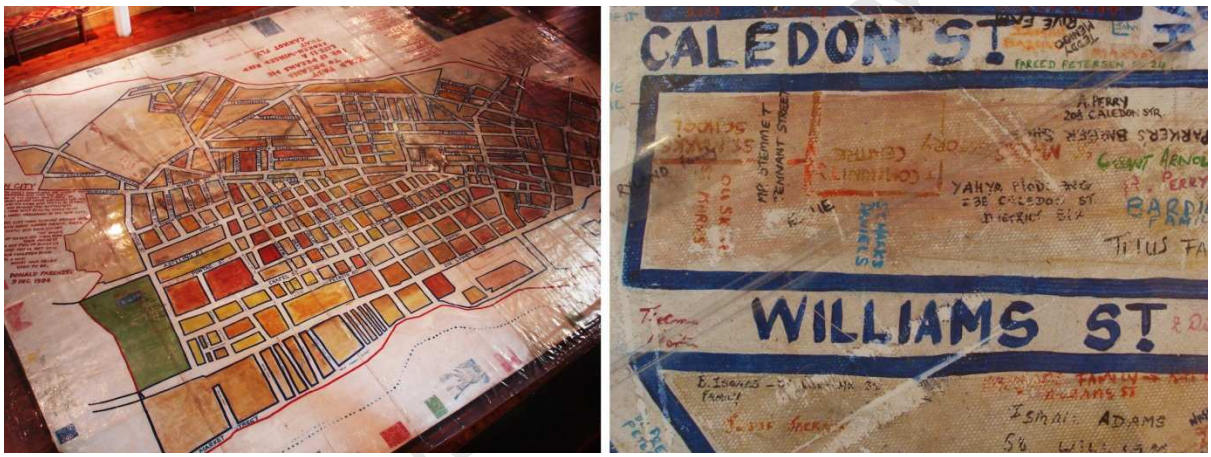


Figure 3.1 The left-hand photograph shows an overhead view of the hand-drawn aerial map which covers the floor of museum's main hall. District Six ex-residents have written on the map indicating where they lived before the forced removals (right).

The museum's lower level contains a number of other exhibits including:

- A series of double-sided panels describing pre-Apartheid Cape Town neighbourhoods, sites of forced removal in the vicinity of Table Mountain, changes made to District Six after the forced removals and photos of Richmond Street, a District Six street, before and after destruction.
- *Nomvuyo's Room* – an enclosed room which recreates the living quarters of Nomvuyo Ngcelwane, an ex-resident who wrote a book about the forced removals.
- A detailed timeline of events from the establishment of District Six to its eventual destruction
- Numerous photographs such as ex-resident's with friends and family in District Six before the forced removals
- *Decay and Demolition* exhibit detailing how the Apartheid government neglected the upkeep of District Six only to use the subsequent urban decay to justify its demolition

The lower level also contains a small museum bookstore, which Noor manages, named 'The Little Wonder Store' after a popular District Six shop. The upper level overlooks the lower level with exhibits on District Six's langarm bands, barber shops and beauty parlours, sports clubs, Bloemhof Flats (a large apartment complex), children's games, Hanover Street (District Six's main street) and trades and businesses. From the upper level hang a number of banners hang showing well-known, deceased ex-residents as well as a memory cloth. The memory cloth is a tradition started by the museum in which ex-residents and museum visitors write messages on a white sheet with marker pen. The messages are then embroidered by hand to make them permanent. The museum's has many of these cloths and, to date, still provides cloths for ex-residents and visitors to write on. At the time of Study One, Menisha continued to embroider the ever-growing collection. The cloth that hangs in the museum's main hall is the very first memory cloth and consists entirely of ex-resident's messages, thoughts, poems, names and former addresses.

Past the museum's main hall, is a small coffee shop which sometimes serves as an ad-hoc storytelling and meeting place for ex-residents who visiting museum. Beyond the coffee shop is the last room in the museum; it deals largely with the museum's project of having a Memorial Park declared in District Six and the on-going process of ex-residents reclaiming their land in District Six. This floor in this room called the 'Writer's Floor' and consists of tiles inscribed with the contributions of various writers and poets according to different themes such as Cape Town and the places people were moved to during the forced removals. This room also houses an exhibit on the Hendricks family, who lived in Horsley Street. The corridors and staircases connecting the different rooms and levels are lined with a variety of photographs including as well as information on forced removals in places other than District Six.

Earlier, we mentioned that the museum is often described as both a community museum and a space of memory. Indeed, the museum does not only serve visitors wanting to find out about District Six but also ex-residents. They organise regular reunions and special events for ex-residents and offer assistance with ex-residents' applications for reclaiming their land in District Six. Furthermore, the contributions and memories of ex-residents are found throughout the museum. Most exhibits consist of objects, ranging from photographs, toys and sewing machines donated by ex-residents, excerpts of ex-resident's stories are displayed as text snippets or played through audio installations and numerous inscriptive exhibits, namely the floor map, memory cloths and Bloemhof Flats have been written on by ex-residents.

According to the original curator, Peggy Delport, the museum was not modelled on existing museums or heritage presentations but rather on ex-resident's stories. This approach focused on providing a space where people could express their stories or donate objects of sentimental value and allow the museum to develop organically from these contributions. This has resulted in a museum rich in ex-resident testimony, and the layering of many perspectives on life in District Six and the forced removals. The value of ex-residents' voices in the museum is unquestionable; the stories are the real memories and experiences of real people. For Joe, this is a defining characteristic of the museum:

> "It's called a museum - I have a problem with that because to me normally a museum is a space where you stare at dead artefacts and they stare back at you. At this stage I'm not a

> dead artefact yet (*some laughter in the audience*), so I call, so I call it a space of memory (*chuckles*). Memory, my memory and memories of people who lived in District six. And this museum also represents what happened throughout the whole of South Africa."
>
> (Joe, Tour Three)

During our stay, we noted a daily routine which affected how many tours took place at any given time. Mornings were usually busier as this was when booked tours, usually student groups accompanied by teachers, with Joe and Noor took place. Mornings also saw many foreign tourist groups led by tour company guides external to the museum. Some of these groups were on a full day tour which entailed visiting the Cape Town city centre, including the District Six Museum, in the mornings and visiting a township later in the day. Two of the outside tour guides we met were District Six ex-residents themselves. In the afternoons, the museum was usually quieter and Joe and Noor tended not to give tours, unless specially requested, taking care of the bookstore and front desk instead.

3.4 Ex-Residents' Tours

We encountered many different guides at the museum, including guides from outside tour groups who were not ex-residents and museum staff, who only occasionally gave tours. We observed as many tours as possible but focused on ex-residents, in particular Joe and Noor. In this section we give background on the ex-resident guides we encountered and describe the content of their tours.

3.4.1 Full-time Guides: Joe and Noor

Noor was born in District Six and lived in a large house owned by his grandfather, an immigrant from India and successful small-business owner in District Six. Noor left District Six at age thirty-one and moved to Athlone, one of the few "coloured" areas where residents could purchase their own homes; he still lives there. The land where Noor's former home was located is now occupied by a large technical college, one of the few new structures built on District Six land by the Apartheid government. He has been at the Museum since it opened and has written a book recounting his memories of living in and leaving District Six which he often incorporates in his tours. (Ebrahim, 2009) At our first introduction, he informed us that he focuses on stories about growing up in District Six, especially from his own childhood. He handles younger school groups (Grades 1 to 8) and reported enjoying these groups because "you can tell them stories for hours, they love it!".

Joe was also born in District Six and grew up in a large apartment complex called Bloemhof Flats, one of the few buildings that was destroyed and rebuilt. At twenty-seven, he left District Six and lived in a number of different "coloured" townships, most notably Hanover Park, for twelve years before moving to a non-township neighbourhood. He worked as a health inspector until retirement giving him unique insight into townships' "deplorable living conditions". Joe has played in langarm band since his youth and, before joining the museum, presented a local radio show on Cape Town culture and music. During our first meeting, Joe stated that he deals with "more academic content" on the enduring negative social impact of the forced removals, particularly drawing from his knowledge and experience of townships. He also strives to exemplify a lack of resentment and forgiveness of Apartheid's injustices.

Museum management regards Joe and Noor more as "resident storytellers" than guides and views their role as one of contextualising visitors' experience through their personal, relatable recollections. This shows in their tours; they spent more time speaking directly to groups as opposed to shepherding them around the museum. Although they incorporate exhibits into their tours, they only referenced a small proportion. Moreover, they usually gathered groups around only two or three different locations in the museum during their tours. Once they finished speaking, they encouraged independent exploration of the rest of the museum and made themselves available to any visitors wanted to engage them one-on-one. Occasionally, they informed visitors that if they had questions about the exhibits they could ask questions. Something else that really struck us after observing many tours was their consistency. Different tours seemed very similar and well-rehearsed with verbatim repetition of phrasing and later analysis of tour transcripts confirmed this. In fact, we found both guides had what we refer to as a *core repertoire* of content, which was present in almost all tours. And occasionally, usually with groups who spent a lot of time at museum, they would delve into an *extended repertoire* (Ladeira & Nunez, 2007).

Noor's Tours:

Noor usually started tours by gathering and greeting groups on the aerial map. He would introduce himself as a District Six ex-resident and one of the museum's founders. Next, he gave brief description of Apartheid and forced removals. He used to the map to point out where his house used to be and explained that the map allows ex-residents to reclaim where they used to live, sometimes telling of ex-resident crying after writing her name on the map. Next, he gave the history of the museum building as a Methodist church whose parish slowly diminished after the eviction of District Six. Occasionally, he would describe the *Streets* Exhibition's part in the establishment of the museum. Next, he usually gathered visitors around the photo wall near a number of his personal photos. His tendency was to sit on a bench here, have the group sit on the floor and deliver the rest of his tour. He started by telling audiences about the importance of memory and writing by telling narratives about taking photos of District Six in his youth and how he came to write his book. Next, Noor almost always told a narrative about his grandfather's life – his immigration, four marriages, thirty children and house in District Six. The narrative goes on to explain that four generations of Noor's family, including his own father and son, lived in that house and how Noor witnessed its demolition first-hand. He would go on to give information about where forced removals took place. This usually led to a description of the 1966 declaration of District Six as a white-only area and, subsequent, eleven-year long demolition and splitting up races into different residential areas and townships. The separation of races was always illustrated with the story: Noor's friend who had married across race was made to live apart from his wife and children after leaving District Six. After this, Noor explained that District Six remained mostly empty due to protests by white activists and refusal of developers to build there. He also talked about Apartheid's Nationalist government culminating in F.W. de Klerk's release of Nelson Mandela from imprisonment, and the Nobel Peace Prize the two leaders eventually shared. After this, Noor usually tackled the topic of the racial segregation of public areas and services such as trains and post offices. He sometimes told a narrative about his sister who worked as a head nurse, but was not allowed to touch white patients. Occasionally, he told a childhood narrative about his friend being refused medical help from a "whites-only" ambulance after a hit-and-run accident. Typically, Noor concluded his core repertoire by telling audiences about the progress of returning District Six land to ex-residents.

Next, he opened the floor to questions and/or delved into his extensive extended repertoire. It included background information on Apartheid laws and the particularly harsh and restrictive treatment of black people. He occasionally included other exhibits in his tours namely the banners of District Six personalities, memory cloth, crafted banners, *Nomvuyo's Room* and the *Demolition and Decay* exhibit. When he included the panels, he would focus on the churches that survived demolition, the location of his former home and school, and racial classifications while pointing out a photograph of his own Apartheid-era identity book. But, mostly, the extended repertoire consisted of narratives: one about another multi-racial married couple who left South Africa to avoid being separated, and then moved back only to be separated under the Mixed Marriages Act; numerous narratives about District Six's community-minded, hardworking gangsters and the overall lack of crime, juxtaposed with South Africa's current high crimes and unemployment rates; an extensive narrative about the financial triumphs and hardships his family faced, including Noor leaving school to take up his first job and the affordability of living in District Six. He sometimes told about District Six residents sharing in each other's different religious holidays and narratives about his family moving to Athlone (a coloured non-township area), District Six's tradition of painting their houses every festive season, childhood games in District Six and his experiences giving talks at present-day racially integrated school groups. Figure 3.2 shows photographs of Noor giving tours at the floor map and in front of his personal photographs.

Figure 3.2 These photographs show the two museum locations Noor Ebrahim incorporated into his tours most. The left-hand photograph shows him on the floor map pointing out where his District Six home was located. The right-hand photograph shows him on a bench, with a group sitting on the floor in front of him, near his family photographs.

Joe's Tours:

Joe's tours consistently occurred in two museum locations: he always started at the panels and then moved to the *Demolition and Decay* exhibit. While his tours contained personal experience narratives, he largely focused, as he had said in our initial meeting, on expositions on Apartheid's history and social impact. He began by welcoming groups and, sometimes, inviting them to sit on the floor at the panels. He explaining that the museum is located "on the edge of District Six" and described the history of the building as a wine cellar and, later, District Six's Methodist church and a safe haven during Apartheid protests and, now, a museum. He covered the panels' content

comprehensively their information with his own knowledge and experiences. For instance, District as a harmonious, cosmopolitan community, he gave a taste of local life describing nicknames used when he was young and the religious tolerance and helpfulness among his neighbours in Bloemhof Flats. This was usually followed by an introduction on the Apartheid government's ideologies and laws[6]. Joe used the panels' photographs to point out that District Six was valuable real estate (which tended to be reserved as "whites-only") and compare the landscape before and after demolition. When discussing the Cape Flats, he described the financial and societal consequences of living further from the city centre and how townships were built to ensure racial segregation that has persisted even after Apartheid's end. Joe then showed audiences the Richmond Street before and after demolition panel. The only panel Joe never included was the one dealing with Pass Laws. We assume this is because, the first part of his tour dealt with District Six and forced removals and the content on pass laws did not fit into these themes.

Figure 3.3 These photographs show Joe Schaffers in the two museum locations he used during tours. The left-hand photograph shows him at the swivel-panels and the right-hand photography shows him, with a seated school group, at the Decay & Demolition exhibit.

Next, Joe always invited groups to follow him to the *Demolition and Decay* exhibit where he usually invited groups to sit down. Here he covered the "reasons and excuses given by the government for demolishing District Six" namely that they claimed it was a "gang-infested slum" while simultaneously neglecting its upkeep. Joe uses Bloemhof Flats to refute this claim noting the residents looked after their buildings, painting and beautifying them every festive season. Joe also explains that the gangs of District Six were relatively "innocent" citing experiences of them carrying home his mother's shopping for tips and low crimes rates. Joe uses photographs to point out the, now lost, craftsmanship of the District Six's buildings. Next, he typically talked about public signs used to designate public amenities to different races and addressed the wealth that was squandered

[6] Namely: Mixed Marriages Act which made it illegal for people to marry across race; Separate Amenities Act which decreed racially segregated public amenities and areas, such as post offices, hospitals and beaches; Immorality Act which made it illegal for people of different races to interact; and Group Areas Act which enforced racial segregation of residential areas; under this law District Six was declared "whites-only".

enforcing racial segregation. Joe also referenced photographs of Bloemhof Flats' demolition, pointing out its scenic surroundings and relating the experience of being moved from his familiar surroundings and neighbours to small, poorly constructed township housing where he did not know any of his neighbours. Here, he used personal narratives to address the emotional impact of this transition on himself and others. Next, Joe gave brief explanations of a few other exhibits including *Streets*, *Nomvuyo's Room*, the memory cloth and aerial map. The latter he usually described as a means by which ex-residents could "psychologically reclaim" their District Six space. Finally, Joe ended his tours in much the same way as Noor – by describing the current state of District Six land restitution residents and inviting audience's questions. His extended repertoire was relatively small and included text on Bo-Kaap, the only Cape Town neighbourhood not subjected to forced removals, affirmative action and, when talking to students, motivation for future careers. Figure 3.3 shows photographs of Joe giving tours at the panels and the *Demolition and Decay* exhibit.

3.4.2 Occasional Storytellers: Menisha and Linda

In Section 3.2 we mentioned Menisha Collins; while she was not a guide, if visitors engaged her, she chatted to them, occasionally telling ad-hoc snippets of her life, such as how she used to attend church in the museum building. In general, she told few narratives, preferring to engage visitors in conversation and show them photographs from her personal album. We also met Linda Fortune on two occasions: when she brought a tour group to the museum and, later, for a one-on-one interview at her home. We took field notes during both encounters (Linda preferred not to be recorded). Linda lived in District Six; she wrote a book about her childhood there (Fortune, 2001) and used to work as a full-time guide at the museum. Even though she no longer worked at the museum, she accompanied specially arranged student groups. The tour we observed took place in the museum and outdoors, in District Six itself. Additionally, it involved a group of American university undergraduates and teachers who was spending a number of days living with Linda and partaking in activities related to a political history class. The tour differed from Joe and Noor's showed the group almost all the available exhibits. But, just like Joe and Noor, she focused on those which related to her personally such as photographs of Table Mountain, where she often hiked, and a radiogram which she donated to the museum. While in District Six itself, she pointed out landmarks which survived demolition such as mosques, churches and a street of houses with distinctive "chimney-pots". Once again, she focused on areas with personal significance. Linda informed us that she also gave storytelling performances, at her home, using a 'memory box'. We were interested in observing how she chose to tell of her experiences, so we arranged to meet for a memory box performance.

Linda's Memory Box:

A memory box may take on many forms but, in essence, it contains keepsakes and memorabilia, each of which is associated with one or more recollections of the past. The concept is not new to cultural heritage or digital storytelling as we described in Chapter 2, Section 2.1. Linda created a detailed memory box as an expression of her District Six narratives. The box contained a mixture of actual keepsakes and miniature objects Linda created to represent certain narratives. She began our interview by presenting an old-style suitcase lined with photographs, some photocopied from various books, including her own, and advertisements featuring products she remembers buying in District Six. The suitcase, in turn, contained numerous small boxes, each one containing a variety of objects. Upon reading Linda's book, we realised that each box dealt with a different chapter or

section. She tackled the boxes in a pre-defined order and each object was associated certain stories from her book. For example, the first box, shown in Figure 3.4, relates to her former home on Tyne Street. The exterior was a model of the façade and while showing this Linda pointed out the front door and tells a narrative about waiting for school reports to be delivered through the letter box. She then opened the box revealing an image of the house's entrance way while describing how District Six houses' entrance ways were typically lined with 'lino' (linoleum) which residents replaced each year. The other half of the box shows an image of the Ghiwala Brothers' Eastern Gem Spice Factory, another building on Tyne Street, along with plastic bags containing spices sold there. She explained that the spices describe the ever-present smells on the street and told us that smell and touch are important in experiencing the memory box; hence she encourages people to pick up and directly interact with the memory box's objects.

Figure 3.4 The first box presented in Linda's memory box performance. It represents her former home on Tyne Street with a model of the house façade on its exterior (left). The right hand image shows the inside of the box: the left side of the box shows an image of the entrance way of a typical Tyne Street house; the right side shows an image of Ghiwala Brothers' Eastern Gem Spice Factory, which was also on Tyne Street, along with bags of spices sold there.

After the first box, Linda successively presented a series of boxes which cover topics such as District Six's shops, weddings and fashions, her father and childhood games. Near the end of the performance her narratives dealt with District Six evictions and demolition, in particular, her own experiences. She closed by showing us a map of Cape Town and the Cape Flats townships, highlighting the latter's distance from the city centre and the how they were designed to separate races. Near the beginning of the performance, Linda addressed all the objects contained in each box. But, as it progressed, the storytelling becomes more improvised. This pattern was reminiscent of Joe and Noor's core and extended repertoires. It seemed as though, with certain boxes, she took charge of which narratives she told. Meanwhile, with other boxes, she allowed narratives to arise during the course of our conversation or from questions we asked. She later confirmed this, explaining that, with certain boxes, the narratives told depended on which objects attracted listener's attention and what they chose to pick up. For instance, in a box dealing with childhood games, there are a multitude of objects. Our attention was drawn to a packet containing stones, leading Linda to open the packet and explain the game of 'Five Stones'. She further explained that she adapts her

storytelling to the interests of the listener and, often, selects which narratives to tell based on the objects that attract their interest. Our field notes on Linda's memory box are given in Appendix A.

3.5 Summary

In this chapter we have described our motivations for studying the storytelling of ex-residents at the District Six Museum. We conducted a three-month ethnography during which we observed ex-resident's tours and storytelling taking field notes and recording and transcribing seven tours. This chapter describes the museum, the ex-residents we encountered and their tours. In the next chapter we focus on answering our research questions regarding the kinds of personal narratives we observed and ways in which the ex-resident's storytelling was dynamic and interactive. Our analysis focuses on the seven transcribed tours.

Chapter 4

Study One: Exploring Narrative Structure & Guide-Audience Interactions

In the previous chapter, we described Study One, our ethnographic study of the personal storytelling of ex-residents at the District Six Museum. We now undertake to answer two research questions: (1) what kinds of narratives were used to convey personal experience and (2) how these narratives incorporated variation and audience interaction. We will draw from the linguistics and discourse analysis work discussed in Chapter 2 to analyse the structure of Joe and Noor's personal narratives, their variation over multiple retellings and their interaction with audiences. Throughout this chapter we will refer to and give excerpts from seven tours which were audio recorded and transcribed. They are labelled numerically, in chronological order. For Noor, Tours One and Three involved audiences of Grade 7 students who were particularly responsive and lasted around an hour. Tour Two was given to a large group of Grade 7 and 8 students who could only spend a half hour at the museum (Noor prefers to spend a full hour with student groups). Hence, it contained shorter versions of most narratives. For Joe, Tour One involved students from a tertiary level academy that provides entrepreneurial training to students with disadvantaged backgrounds. The majority of these students lived in Cape Flats townships. Tour Two, involved American university students visiting Cape Town as NGO volunteers, Tour Three involved students from a local private high school, and Tour Four, local university students. Tour excerpts are enclosed in double quotations and ellipses indicate when part of a quoted text has been omitted. Commas and full stops indicate places where the guide paused, and italicised words indicate spoken emphasis. Additional information, such as guides' gestures or audience reactions, are indicated in italics and enclosed in round brackets. In the occasional instances where Afrikaans was spoken, we include translations in square brackets.

Section 4.1 describes our analysis of narratives structure, which allowed us to understand the types of narratives used by the guides. We discuss how the narratives varied over multiple retellings and at what points interactions between guides and audiences occurred. We present a detailed analysis of two narratives, one from each guide, which illustrate our findings. In Section 4.2 we take a closer look at the guide-audience interactions. Section 4.3 summarises Study One's main findings.

4.1.Exploring Personal Narrative Structure

We conducted a discourse analysis of all the personal narratives contained in our tour transcripts in order understand the kinds of narratives Joe and Noor told. A discourse analysis examines stretches of language while taking their full context into consideration (Cook, 1989). We identified the verbal clauses making up each narrative and then judged whether they matched the classic narrative structure proposed by Labov (1972) and the genres of Martin & Plum (1997). We also noted when

interactions between the guides and audiences occurred during narratives. The results of these analyses are presented in Section 4.1.1. Next, we selected those narratives with the most retellings and explored their structure over multiple retellings (Section 4.1.2). These analyses are lengthy, so, rather than present all of them here, we present a detailed analysis of two narratives, one from each guide, in Section 4.1.3. These two narratives illustrate all the findings discussed in Sections 4.1.1 and 4.1.2.

4.1.1. Genres and Characteristics of Joe and Noor's Personal Narratives

One might expect that telling narratives of personal strife might serve as a way of dealing with past trauma. But, our time observing Joe and Noor's tours revealed that their storytelling serves a more pedagogical purpose. They do not tell their stories in order to process their traumatic experiences; they tell them to educate audiences of on the human impact of forced removals. Furthermore, they strive to not only convey the negativity of Apartheid but to convey a message of optimism and forgiveness in post-Apartheid South Africa. Joe and Noor are in the relatively unique position of having told their stories repeatedly, daily for a number of years. As we will discuss later, this has resulted well-rehearsed storytelling; it is also possible that this repeated retelling has desensitised effect in terms of how traumatic they were to tell. Since their narratives were told, not to deal with the trauma of forced removals, but to convey their experiences and teach audiences, we focus on that purpose in our analysis of their narratives.

Labov (1972) proposed that personal narratives consist of an ordered sequence of elements; some are always present and others are optional: *abstract* (optional); *orientation* (optional); *complicating action*; *evaluation*; *result* (optional); *coda* (optional). Additionally, personal narratives may have a *narrative preconstruction* wherein multiple orientation clauses relay a series of events, or *causal network*, which lead up to the complicating action (Labov, 2010). The evaluation, in which the storyteller reveals the so-called 'point of the story', often occurs near the end of a story, but can occur at any point during the story action (see Chapter 2, Section 2.2 for a detailed review).

Martin & Plum (1997) further defined three genres of personal experience narratives whose structures differed somewhat from Labov's:

- **Recounts** report a series of events.
- **Anecdotes** convey emotional or humorous aspects of an experience.
- **Exempla** teach a lesson or convey an opinion regarding an experience.

The only genre whose structure differs greatly to Labov's structure is the recount in which evaluative clauses do not appear. While anecdotes and exempla serves different functions, their clause structures are very similar to Labov's structure with the exception that, in anecdotes, the *evaluation* and *result* clauses are merged. Most adult narratives are not recounts and, accordingly, none of Joe and Noor's recorded narratives were recounts (Labov, 2010). Their personal narratives tended to exhibit the structure of either anecdotes or exempla, and they made use of a variety of evaluative devices to convey the purpose of their narratives (Polanyi, 1989; Labov, 2010). In the examples that follow, we use the following naming scheme: abstract (*A*), orientation (*O*), complicating action (*CA*), evaluation (*E*), result (*R*) and coda (*C*). For anecdotes, merged evaluation and result clauses are

indicated as *E + R*. We allowed story events to guide our discourse analysis such that each clause covered one story event, though or unit of information. This was similar to method used in Martin & Rose's (2003) discourse analysis of written Apartheid-era texts. Furthermore, we used discourse markers such as "then", "but", "and", "so" and "now" as guides in determining the starts of clauses (Pridham, 2001).

Joe and Noor's anecdotes tended to convey the emotions District Six residents experienced during forced removals. In the following example, Joe conveys the sadness and tragedy of receiving eviction notices:

> *A:* "...a lot of the old folk died…"
>
> *O:* "Personal friend of mine who lived out in Sea Point, Tramway Road."
>
> *CA:* "His father received his notice, read the notice, couple of days later, walked out of the front door, and they found him hanging in the trees between Sea Point and Camps Bay."
>
> *E:* "One of many suicides (that) were committed by people, because they couldn't stand the fact, that they'd been totally destroyed, their lives had been totally destroyed, because of the colour of their skin."
>
> (Joe, Tour Four)

In one of Noor's most personal narratives, he tells of his family history, starting with his grandfather leading into a description of how four generations of his family, including himself and his own children, lived in his grandfather's house. The story culminates with Noor witnessing the house being bulldozed and describing how it felt to watch the demolition:

> *CA*: "...I was watching them. I was standing there, (*points to a photograph of the house*) right there, right in front of me."
>
> *E*: "And I *cried.* I was so angry (*soft tone*)."
>
> (Noor, Tour One)

Joe and Noor's exempla mostly focused on conveying similar points of view, namely to convince listeners that Apartheid was unjust and ultimately disadvantaged South Africa as a whole. Joe's exempla addressed its false justification for demolishing District Six by claiming that it was a slum. In the following example, the use of wording that cast non-white people as sub-human:

> *O*: "Then if you take a look at our notices that were put up at our various recreational areas (*points to the notices behind him*). And it says 'For the use by white persons'. Oooh, very nice, white persons!"
>
> *O*: "... But then they write a notice for people of colour and it says 'Parking area for 3 taxis. Non-whites.'"

CA: "And, they dropped the 'persons'..."

E: "So already psychological mind games (*gestures to his head*). You already tell yourself, 'Ooh, if I'm not white I can't be a person'. Engineering of the minds."

(Joe, Tour Two)

Numerous exempla also focused the importance of forgiveness. During our first meeting with Joe, he explained that demonstrating a lack of resentment about Apartheid was an important goal in his tours. Similarly, Noor concluded a number of his stories by stating that he does not blame those who enforced Apartheid. In one example, he tells a childhood story about playing outside when his friend is hit by a car. An ambulance arrives, but refuses to take his injured friend to hospital because it was a 'whites-only' ambulance. The story concludes:

R: "But you know, we were so lucky... another ambulance came with a sign: 'Non-whites'. And we took my little friend to the hospital."

E: "He would've died!"

E: "But um, again I don't blame him, because that was his job, he had to do it, you know!"

(Noor, Tour One)

The evaluation in the above example has two parts. The first illustrates the judgment that the story events could have led to the death of Noor's friend. Labov (2010) refers to this kind of evaluative clause as an *irrealis* clause because it refers to events that might have happened as a way of bringing across the point of the story. The second part of the evaluation conveys the judgment that the ambulance driver was not blame.

While Joe and Noor's narratives exhibited Labovian structure, we also noted some distinctive characteristics which most resulted from their storytelling style as well as the museum setting. Labov, and Martin & Plum analysed narratives elicited in interviews where participants were prompted tell or write a personal narrative. However, the narratives we observed were told to groups of listeners during museum tours. We did not prompt these stories nor interact with the guides[7]. The following are by no means an exhaustive description of Joe and Noor's storytelling; we have chosen to describe those characteristics the most influenced our understanding of their storytelling.

Lengthy Narrative Preconstruction:

Labov (1972; 2010) describes narrative preconstruction as a series of orientation clauses which lead up to the complicating action. Norrick (2000) categorised orientation clauses as providing three kinds of content: the time and place of the narrative events (general frame); contextual information (background information); and events leading up to the narrative's complicating action (narrow frame). Many of Joe and Noor's narratives featured long sequences of orientation clauses – as many as nine – which gave a lot of background information in the form of far-reaching backstories and

[7]Except for a handful of occasions where the guide interacted with the main researcher directly.

historical context. Noor's anecdote about his family home typically began with an orientation about how his grandfather's emigration from India, his marriages and his house which became Noor's family home. After this long preconstruction, Noor describes witnessing the house being bulldozed. We believe that the fully fleshed-out context builds up the importance of the house to Noor's family and served to make the emotional evaluation more impactful.

The Presence of Non-narrative Content:

Since Joe and Noor's storytelling were couched within museum tours, it was not surprising that they related a combination of narrative and non-narrative content such as dates and descriptions of key events in the rise and downfall of Apartheid and the laws that brought about forced removals. Katriel's (1997) ethnography in Israeli settlement museums similarly found that guides telling personal experience narratives would, similarly, alternate "standardised factual content" and "narrative segments". Our interest was in understanding the delivery of the latter, however, we found that these contained much non-narrative content, usually in the narrative preconstructions, providing background information which contextualised the narratives in the landscape of Apartheid South Africa. Sometimes, we found that non-narrative content predominated. For instance, with Joe's tours, focusing on personal narratives was a challenge as he told relatively few of them. He himself told us that his tours focused more on Apartheid's history and social consequences. His personal narratives mostly told of others' experiences and, references to his own experiences were usually brief.

Narrative Digressions:

Sometimes, the guides digressed briefly from a narrative's main plot to tell a second, related narrative. We particularly found this in narratives with long preconstructions. Furthermore, the secondary narratives themselves exhibited the Labovian structure of complete personal narratives. Norrick's (2000) analysis to spoken narratives found similar digressions with their own, internal narrative structure.

Consecutive, Thematically Linked Narratives:

Since we were working with museum tours, our analysis involved identifying narratives from a continuous stream of talking (ranging from five minutes to an hour in length). This presented the challenge of identifying where one narrative ended and a new one began. There were cases where narratives were difficult to separate from each other because they were strongly related and always told together. Joe would often introduce a topic and then tell a series of short personal narratives related to it. Noor routinely told sequences of related narratives. For example, he usually told of the Immorality Act, racially segregated post offices, his sisters' experience as a nurse and the earlier described exemplum about racially segregated ambulances, together, under the umbrella of racial segregation.

Narratives Linked to Objects:

Another consequence of working with museum tours was the setting contained numerous exhibits – some of which were directly related to the guide's personal histories. As in previous ethnographic studies of museums guides, Joe and Noor incorporated particular objects into their narratives (Katriel, 1997). They provided context for the objects and used them as visual aids. In Chapter 3, we described how Joe and Noor both always told the same the narratives in certain locations of the

museum. Usually, the location contained objects, primarily photographs, which supported their narratives or related to them personally. For instance, Noor would only tell narratives about his family and District Six home while in the vicinity of photographs of the house and his siblings and son. He also routinely used his own book as an aide since it contained additional photographs of his grandparents. When he told his narrative about the importance of memories and how he came to write his book, he would always show audiences the book.

Joe started all his tours at the panels near the museum's entrance and referred to the photographs on them when explaining the location of District Six and Cape Flats. One of Joe's most effective narratives, in terms of drawing audience responses, relied on the Richmond Street panel. Here, he presented audiences with the photograph of a busy 1960's Richmond Street pointing out the cobbled road and buildings. He would then reveal present-day Richmond Street – a desolate field with some street and building remnants. This visual comparison, which usually surprised audiences, relied on the panel photographs. Furthermore, at the Demolition and Decay exhibit, Joe always pointed to a photograph of Bloemhof Flats being destroyed while telling about his personal experience of being moved from there to the unfamiliar, unforgiving townships. Indeed, the way in which both guides followed the same pattern of movement around the museum space and same, corresponding ordering of narratives suggests their tours were constructed around a set of focal objects.

The linking of narratives to objects was seen most explicitly in Linda's memory box (see Chapter 3, Section 3.4 and Appendix A). Just as in the museum, certain narratives were always told in reference to specific objects. For example, Linda always told narratives about her former home and street while referring to a box that was made to resemble her former house. The memory box had the added dimension that Linda selected which narratives she told based on which objects attracted listener's attention.

4.1.2. Variation across Multiple Narrative Retellings

Exploring multiple performances of a narrative provides a way of identifying which elements remain stable and which vary in different contexts. This, in turn, allows for the distillation of its essential structure (Norrick, 2000). To ensure the maximum number of narratives retellings to analyse, we identified those anecdotes and exempla which appeared most often in Joe and Noor's tours. We selected two narratives from Noor: the one about his grandfather and family home and another about the creation of racially segregated neighbourhoods and the impacts of the Mixed Marriages Act on a friend. We selected three narratives from Joe: one dealt with the experience of moving from Bloemhof Flats to a township; the second addressed the wording used in public signs; and a third about Richmond Street's demolition. For each narrative, we had transcribed three to four retellings giving eighteen total retellings to analyse.

Even while still observing tours at the museum, we had the sense that Joe and Noor's narratives were not highly dynamic. The discourse analysis confirmed that, across multiple retellings, there was remarkable consistency structure and, often, verbatim repetition of phrasing. We posit that this consistency was due to the fact that Joe and Noor tell their stories multiple times daily; hence they are well-rehearsed (Ladeira & Nunez, 2007). Norrick (2000) similarly found that narrative structure

can remain "substantially intact from one telling to the next" and "frequent retellings leads some tellers to crystalize and recycle stories … tailoring them just as much as necessary to fit the current context". Moreover, we noted minimal amounts of tailoring since the storytelling we were studying always occurred in the same setting with predictable audiences (most often school groups and foreign tourists). While we expected some stability in narratives, the extent of the similarity across retellings was surprising and disappointing as we had hoped to study *dynamism* in oral storytelling.

This is not to say that all retellings were identical – there were minor variations which arose, chiefly, due to interaction with audiences (described further in Section 4.2) and amount of time spent with a group. In longer tours, the guides usually told longer versions of the narratives, whilst shorter tours featured somewhat abbreviated versions. Longer versions ordinarily contained more orientation clauses, providing comprehensive background information. Where longer versions featured digressions to tell a secondary narrative (as mentioned in Section 4.1.1), shorter versions tended to omit these. This led us to conclude that shorter versions consisted of clauses that were essential for conveying an experience while clauses which only appeared in longer versions might be considered optional elaboration.

There were two further, less frequently observed, sources of narrative variation. First, guides sometimes incorporated current events. A well-known trait of oral storytelling is that it content can be updated to be relevant to current historical or social contexts (Portelli, 1991; Norrick, 2000; Ochs & Capps, 2001). For example, Joe positioned recent surges in Cape Flats drug addiction rates and the vigilante action against drug dealers as an on-going social consequence of Apartheid:

> "You obviously read the papers now, about people going on a march against the gangsters now, setting the drug lords' houses alight... they just exploded over these last three days... we (are) still sitting with problems that developed at that time (during Apartheid) already."
>
> (Joe, Tour Three)

Secondly, the guides adjusted their narratives, in minor ways, based their perceptions of a current audience group. This is referred to as audience accommodation (Livo & Rietz, 1986; Bauman, 1986; Katriel, 1997). Joe and Noor tried to build common ground and tap into things that would be familiar to current audiences. In Joe's Tour One, where the audience consisted of students living in the Cape Flats, he spoke more Afrikaans, included far more content on Cape Flats townships than usual and emphasised his personal history of living and working there. At one stage he engaged in a lengthy interaction with the group about where they lived (in Section 4.2.2 we explore this example further). After observing numerous tours, we came to realize that the guides' audience accommodation was quite predictable, almost heuristic. For example, adults heard more information about Apartheid's history and societal impact than young children. With local audiences there were more references to local culture and places. With American groups, guides made references to American history, for instance Noor would explain Apartheid using Segregation as a point of reference. He also established common ground with British, Scottish or Irish groups by emphasising his Scottish heritage – in one instance stating "I'm also Scottish" and later, while showing a picture of his Scottish grandmother, "We are related".

4.1.3. Two Example Narratives

The two narratives in this section exhibited closely matched Labov's structure, Martin & Plum's genres and the characteristics described in Section 4.1.1. They also illustrate the consistency of the narratives over multiple retellings and show when guide-audience interactions occurred. Rather than give the full, lengthy, texts here, we present our analyses diagrammatically. Narrative elements are represented as rectangles labelled using the *A-O-CA-E-R-C* scheme we have used throughout this section and a short quote from the clause's text. Interactions are represented as circles quoting the words that initiated the interaction. Interaction circles are also labelled: *I* indicates a guide-initiated interaction; *C* indicates an interaction initiated by an audience comment; and *Q* indicates an interaction initiated by an audience question. Links between narrative elements and interactions indicate their ordering. The full text for these narratives, accompanied with their structural breakdown can be found in Appendix B.

Group Areas and Mixed Marriages Acts:

One of Noor's most effective stories for drawing audience responses was an exemplum about the unfairness of two Apartheid laws: the Group Areas Act and the Mixed Marriages Act. It tells of how existing neighbourhoods and new townships were racially segregated such that Noor's friend, who had married across race, had to live apart from his family. Our analysis of this narrative's three retellings is shown in Figure 4.1. This narrative had a remarkably consistent structure in retellings spread out over three months.

It exhibited a narrative preconstruction consisting of seven to eight orientation clauses, most conveying background information, such as the declaration of District Six as whites-only, the long commute into Cape Town from the townships and general frame about the bulldozing of District Six and Noor's neighbour. These lead into narrow frame clauses about Noor's friend's marriage, which leads to the complicating action. This narrative preconstruction illustrates the incorporation of background information in a personal narrative before segueing into story events. In two tours, Noor started by telling about when District Six was declared a whites-only area. This part was told as a complete anecdote in two tours; he not only tells about the announcement, but also District Six residents' reactions:

> *A:* "You know what was so sad? We didn't know this was going to happen."
>
> *O:* "I remember in 1966, February, 1966... we saw the headlines in our newspapers."
>
> *C:* "Big! District Six declared a whites only area."
>
> *E:* "Of course, people were sad, angry, right? People were worried 'What's going to happen to us? Where are we going to? We're going to be separated from our friends, our neighbours, and even our families!'."
>
> (Noor, Tour Three)

This shows the phenomenon of digressing briefly from the main narrative to tell another complete narrative. Noor did not tell this anecdote in Tour Two, where he had less time with the group. Instead, he simply stated that District Six was declared whites-only on 11 February 1966. This

reinforced the idea that the above anecdote was contained within the Group Areas and Mixed Marriages Acts exemplum. After telling about the 1966 declaration, Noor described the arrival of bulldozers in 1970 and, subsequent, eleven-year demolition of District Six. Then he describes how the government created racially segregated townships for non-white people. Here he briefly explains that townships are located far from the city centre and uses Edith, a museum employee who lives in a township, as an example of someone who has a time-consuming and costly work commute. However, Edith-related clauses usually only appeared in tours where she was present in the museum's main hall. Thus, an orientation clause about Edith does not appear in Tour Two, either because Edith was not present during this tour or because this tour was time-constrained.

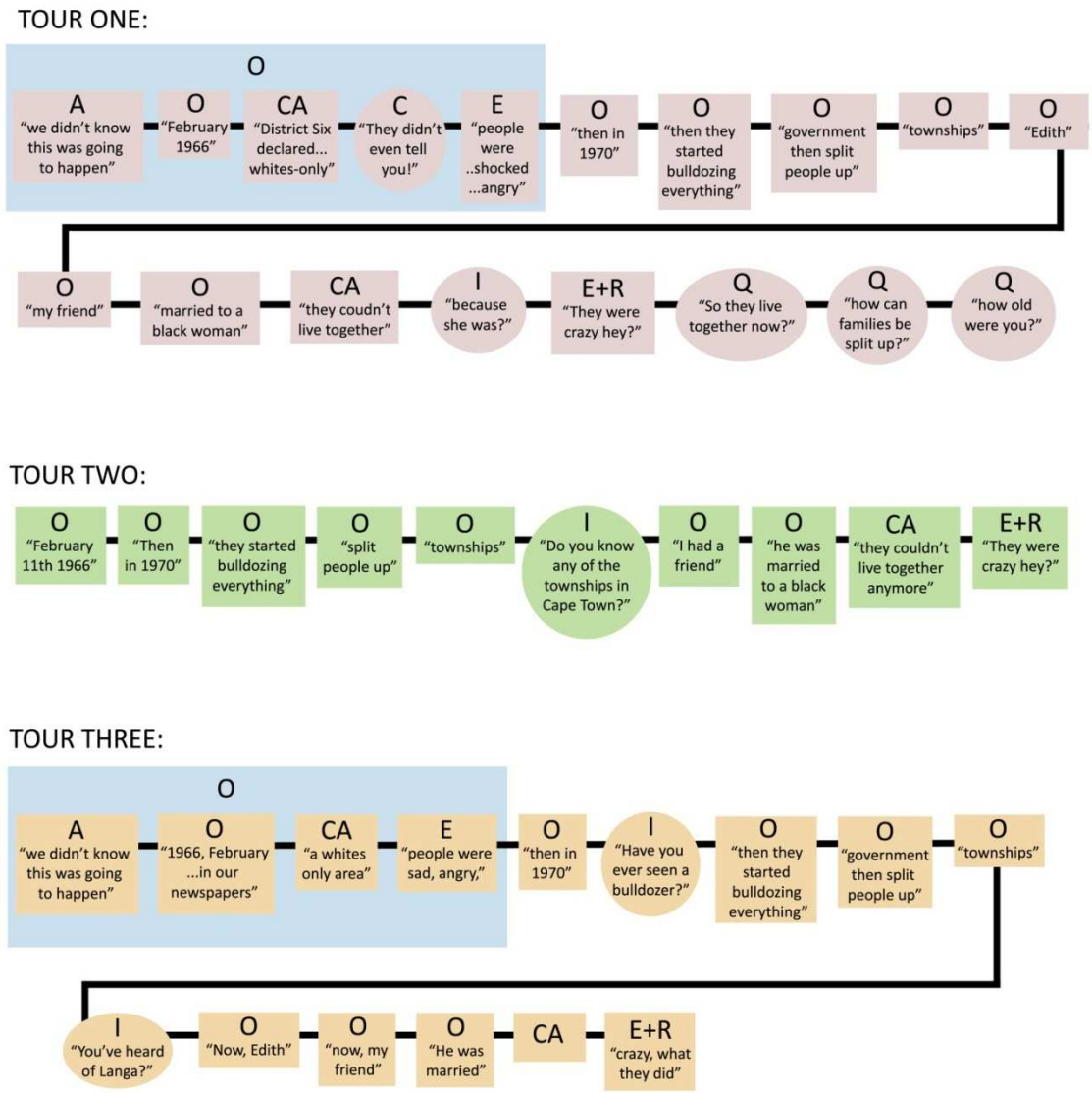


Figure 4.1 Discourse analyses of three retellings of one of Noor's narratives. Rectangles represent the narrative's clauses and are labelled with quote from the original narrative and narrative clause name: A (abstract); O (orientation); CA (complicating action); E (evaluation) and R (result). Circles represent interactions and are labelled with the text quote that initiated the interaction and: C (audience comment); Q (audience question) and I (guide-initiated interaction). Links between clauses and interactions show their ordering.

Up until this point, the narrative mostly conveyed background information and general frame. Next, there were two orientation clauses, more typical of Labov's narratives, which introduce Noor's

childhood friend who had married across race. This leads to the complicating action that the narrative has been building toward: after the removal of District Six residents, Noor's friend could not live in the same township as his wife and children. The ending, which was very similar each time Noor told it, combined the narrative's result (that his friend could only see his wife with a permit and for limited amounts of time) and evaluation (that Apartheid was crazy):

> "…The government said to the wife 'You must go to Langa *with* your three children because the children were, they were dark skinned, so they were classified as, black! Right! And the husband got sent to Michell's Plain. See what the government also did, they also split up families and he couldn't see his wife. If he want(ed) to see his wife he's gotta go to the, police station… get a permit to see his own wife. And he was *allowed* to see her every three months for two hours only. They were crazy hey? They were absolutely crazy what they did to people."
>
> (Noor, Tour One)

From Bloemhof Flats to the Cape Flats:

This narrative, from Joe, consisted of three short anecdotes, which were always in sequence. Upon further inspection, we realised they were thematically related as they all dealt with the experience of leaving the familiarity of District Six for unfamiliar, unpleasant townships. In the first anecdote, the audience's attention is directed to a photograph of Bloemhof Flats being demolished. The orientation consisted of pointing out the scenic surroundings of the building. In the complicating action Joe reveals the building is, in fact, his former home. This anecdote, typically, had two concluding clauses: the first about how people were "kicked out of those solid structures" and "thrown out in the Cape Flats" government-built housing; and, the second, about that housing's poor construction. This leads to a second anecdote where two orientation clauses describe District Six's communities and neighbourly bonds were disrupted by forced removals. In the complicating action Joe describes the experience of relocating to Hanover Park (a township) far from his former neighbours and concludes, in the evaluation, by describing the consequent feeling of isolation. In the third anecdotes Joe addresses the impact on "the older folk" by telling of a friend whose father committed suicide upon receiving his eviction notice and suggesting that numerous similar suicides resulted from forced removals.

Not only did these anecdotes occur in sequence, but Joe's wording indicated that they were linked. The abstracts of the second and third anecdotes not only suggested what the forthcoming story would be about but also referred to the previous anecdote. The abstract of the second narrative almost always began as follows, respectively:

> At the start of the second anecdote: "Now you can imagine what this did, to people…"
>
> (Joe, Tour Two)

> At the start of the third anecdote: "Y'can imagine what this did to the older folk."
>
> (Joe, Tour One)

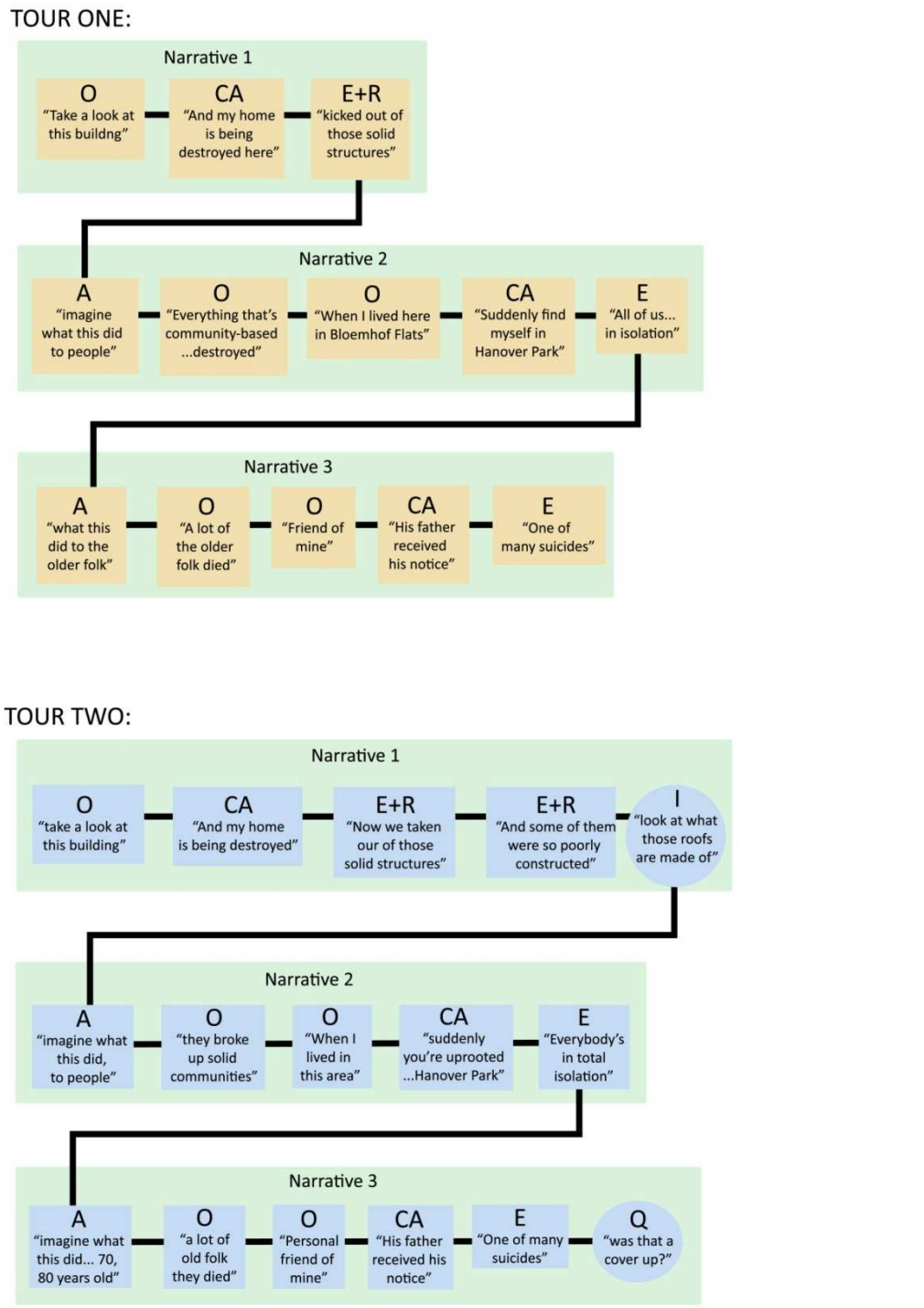


Figure 4.2 Discourse analyses of two retellings of one of Joe's narratives. Rectangles represent the narrative's clauses are labelled with quote from the original narrative and narrative clause name: A (abstract); O (orientation); CA (complicating action); E (evaluation) and R (result). Circles represent interactions and are labelled with the text quote that initiated the interaction and: C (audience comment); Q (audience question) and I (guide-initiated interaction). Links between clauses and interactions show their ordering.

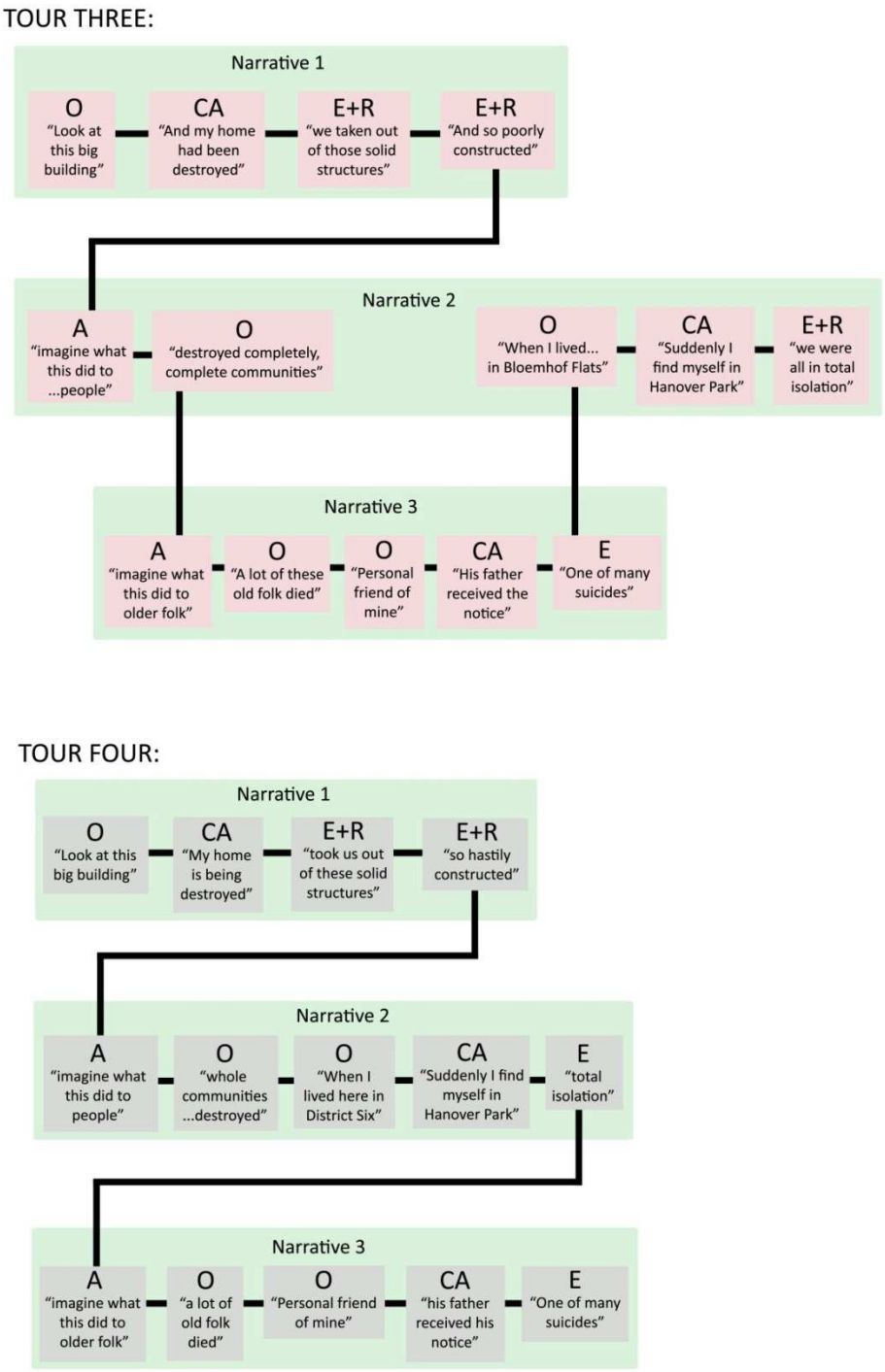


Figure 4.3 Discourse analyses of two retellings of one of Joe's narratives. Rectangles represent a narrative's clauses and are labelled with a text quote and: A (abstract); O (orientation); CA (complicating action); E (evaluation) and R (result). Circles represent interactions and are labelled with the text quote that initiated the interaction and: C (audience comment); Q (audience question) and I (guide-initiated interaction). Links between clauses and interactions show their ordering.

In both cases these abstracts referred back separation of neighbours and communities described in the previous narrative. Similarly, the third anecdote's abstract refers to the preceding anecdote which described being moved to a township without familiar neighbours. We analysed four retellings (spread out over two months) of this narrative sequence; the Tour One and Two retellings are given in Figure 4.2 and Tour Three and Four in Figure 4.3. Just as with the previous example, their

structure hardly varied. In fact, the only real variation occurred in Tour One where the first narrative did not include an evaluative clause about the poor construction of township housing. The three anecdotes, furthermore, always appeared in the same order with the exception of Tour Three. There, Joe diverged from the second anecdote (about the isolation of Hanover Park) to tell the third anecdote (about the impact of forced removals on older people). After telling the third anecdote, he returned to the second. This was a notable difference to the other three tours, but, the insertion of the third narrative into the second narrative shows how intertwined these three anecdotes were.

4.2. Guide-Audience Interactions

Oral storytelling typically presents the opportunity for a storyteller and audience to shape a unique experience of a story together (Bauman, 1986). District Six Museum audiences appeared to enjoy and appreciate the opportunity to engage with ex-residents, and, interacting with the guides appeared to keep their attention focused on tours. Reflecting on the fact that the narratives we were studying were couched in museum tours, we concluded that there were elements of classic oral storytelling, conversation and teaching. This led us to draw on previous work on speaker-listener interactions in conversational and oral storytelling as well as teacher-student interactions. In Section 4.2.1 we use the narrative structures of the previous section to discuss *when* interactions tended to occur. Section 4.2.2 describes the types and characteristics of interactions we found.

4.2.1. When Interactions Took Place

Guide-audience interactions usually entailed an interruption of sorts to narratives. Yet, they were incorporated *without* disrupting the narrative progression - in way that either contributed to the narrative or allowed guides a naturally resuming of the narrative after concluding an interaction. Inspecting the structure of Joe and Noor's narratives led to an important finding: interactions never took place during a clause but always *between* them. Figure 4.1 shows that interactions occurred at different points in all three retellings of Noor's example narrative, but always between, never during, clauses. In Joe's example narrative (Figures 4.2 and 4.3), only Tour Two featured an interaction[8], which took place at the end of a clause. Beyond these two example narratives, all the narratives we analysed consistently showed that interactions only occurred between clauses.

In conversation, turn-taking rules govern who can speak at any particular point with a current speaker having 'the floor' (Sacks, et al., 1974). As described in Chapter 2, Section 2.3, stretches of speech during which a new speaker cannot start speaking are *turn constructional units* (TCU). When a TCU is complete, it becomes possible for another person to speak; this opportunity is termed a *transition relevance place* (TRP). There are a number of ways to give the floor to a next speaker, ranging from pausing to directly assigning someone else to speak. Now, Joe and Noor's tours were not conversations in the sense that everyone involved had equal rights to the floor. It was clear that the guides controlled the floor and would give it up to audience members periodically and temporarily. This was similar to Katriel's (1997) finding that a museum guides' voice dominated in tours and they controlled the topics discussed. We found that the narrative's clauses functioned as TCUs, and the spaces between them as TRPs during which an audience member could, temporarily, have the floor. Audiences allowed the guides to control the floor by waiting for a pause to make a

[8] This was actually reflected Joe's storytelling style which tended include slightly less interaction than Noor's.

contribution or raising their hands and waiting to be called on. Once interactions concluded, the guide would take back control of the floor and move on to the next clause, or TCU.

4.2.2. Types of Interactions Observed

Livo and Reitz catalogue ways that oral storytellers interact with audiences: *ritual participation* involves inviting the audience to recite or sing along with them; *co-active participation* describes audiences' spontaneous, unsolicited reactions to a story; *banter* is dialogue between the storyteller and audience; and *questioning* is a form of banter initiated by the storyteller posing narrative-related questions (Livo & Rietz, 1986). The tours we analysed all involved school or university student groups Katriel's (1997) ethnography in two Israeli settlement museums found that guides tended to taken on the role of a teacher-guide with student groups. Similarly, in tours with students, Joe and Noor appeared to take on the role of teacher – sometimes this was stated explicitly at the beginning of tours:

> "…ignore your teachers hey, I'll be your teacher for the next, thirty minutes, ok."
>
> (Noor, Tour Two)

> "Ok, for the next hour I'm gonna be your teacher, hey? And you're gonna listen to me."
>
> (Noor, Tour Three)

This led us to consider Sinclair & Coulthard's (1975) work on classroom interactions. They provide a detailed analysis of setting in which one person (the teacher) controls and the floor while responding to and eliciting interactions with a group (of students) – this resonated strongly with the museum tours. They termed interactions between teachers and students as *exchanges* and defined multiple types (see Chapter 2, Section 2.3). Through this lens, ritual participation may be classified as a *teacher direct* exchange in which the teacher, or storyteller, directs students to carry out the action of reciting or singing. Joe and Noor rarely directed groups or initiated ritual participation. Sometimes Noor invited visitors to read a poem on the memory cloth along with him. Sometimes groups were prompted to read sign exhibits such the 'Europeans Only. Slegs Blankes,' sign on an Apartheid-era bench. Audience questions map to *pupil elicit* exchanges, where students initiate an interaction with a teacher. Numerous interactions during Joe and Noor's tours were initiated by audiences, particularly in more attentive groups. There were reactions of shock and surprise to Apartheid-era events, laughing at jokes, and head nodding and shaking. Audience reactions and inputs often resulted in banter, or exchanges, with the guides. For instance, during Tour One of Noor's *Group Areas and Mixed Marriages Acts* narrative, a spontaneous audience comment, labelled *C* in Figure 4.1, leads to the following exchange:

> *CA:* "…District Six (was) declared a whites-only area."
>
> Child: "They didn't even tell you!" **(initiation)**
>
> Noor: "They didn't tell us, no. We only saw the morning, on our way to work." **(reply)**
>
> *E:* "So we saw the posters. Of course, people were, were shocked…"

Noor replies to the comment by reiterating earlier-stated story events and then moves onto the narrative's evaluation. Joe and Noor often handled audience comments like this – by giving short replies and returning to the narrative. *Teacher elicit* exchanges describe instances in which a teacher poses a question in order to draw a reply from a group and, potentially, initiate a number of subsequent exchanges. Joe and Noor almost always initiated interactions by posting questions. In the two examples narratives, the guide-initiated interactions (labelled *I* in Figures 4.1, 4.2, 4.3 above) were initiated by posing a question. In fact, the most common initiator of guide-audience interactions in general, were questions posed by guides and audience members. Therefore, we paid special attention to analysing these two classes of interactions.

Questions from the Audience:

As mentioned earlier, audience's questions results in interactions that matched Sinclair & Coulthard's pupil elicit exchanges: the question served as the *initiation* which would elicit a *reply* from the guides. In keeping with the finding that interactions never took place during clauses, we noted that audiences sometimes waited for a pause in the storytelling, which always came at the end of a narrative clause, to ask their questions. More often we observed audience members signal their desire to ask a question by raising their hands. The guides, in turn, only allowed questions from the audience when they finished their current clause. Guides acknowledged and allowed questions by gesturing and/or saying something like "Yes, question". Hand-raising was adopted naturally by most groups and, often, encouraged by the guides:

> "If you have any questions, you raise your hand and I will answer your questions."
>
> (Noor, Tour Two)

Where hand-raising was involved, interactions took to the form of: the guide's *acknowledgement* of the raised hand; the audience member's *question;* and the guide's *reply.* Occasionally, these interactions led to back-and-forth banter. But, most often, after answering a question, guides would return to the narrative or, if someone else had their hand raised, on to another audience member's question. Audiences frequently waited until the end of whole narratives to ask questions, as happened in both the example narratives of the previous section. Furthermore, there was a tendency for only single questions to arise during a narrative and multiple questions at the end. Multiple questions were sometimes initiated by one audience members asking a question leading to others asking more subsequent questions. For example, at the end of Noor's Group Areas and Mixed Marriages narrative in Tour One (see Figure 4.1) where, once Noor finished the narrative, a child in audience asks a question leading to two more questions from other audience members:

1. Child One: "Do they live together now?" **(question)**

2. Noor: "They, they still together. But, after 10 years, after 10 years." **(reply)**

3. Child One: (*inaudible)* **(follow-up question/comment)**

4. Noor: "After 10 years. I mean, he didn't see his children grow up! Ok. Ok." **(reply)**

5. Child Two: "Sorry um, but um, um, was, if, if, if. How can families be split up? I mean um" **(question)**

6. Noor: “That’s what the government did!” **(reply)**

7. Child Two: “But, but, uh, uuum-” **(follow-up comment)**

8. Noor: “It, it’s difficult to understand, nê [translation: hey]? It’s difficult to understand, nê [translation: hey]?” **(reply)**

9. Child Two: “What happened if there’s two different races married together? Then they would just-” **(follow-up question)**

10. Noor: “They would just, they would just split! … That’s what Apartheid did to us. Can you imagine what we went through? Now, I just said I’m sixty-one, sixty-three years old and I *lived* through Apartheid. They were *crazy*! They were *crazy* what they did to people! Right? Now-” **(reply)**

11. Child Three: “Sorry, how old were you, when they-” **(question)**

12. Noor: “I was about thirty-one, that time. Ja, ja [translation: Yes, yes].” **(reply)**

13. Noor: **“**Now, if you look at District 6 today…”

(Noor, Tour One)

This excerpt shows some of the less common question-asking behaviours we mentioned earlier. Firstly, none of the children raised their hands; so there are no *acknowledgements*. Second, there are two instances, with Child One and Two, of the interaction continuing beyond the guide’s first reply to a question. With Child One, we could not hear his follow-up so we cannot be sure if he asked another question or made a comment. But, Noor’s second reply, in line 4, reiterates his first reply, suggesting that the child made a comment. Child Two appeared to have a difficult time accepting Noor’s answer to his initial question in line 5 leading to two follow-ups. In line 7, he was still trying to process the idea that families were split up. In line 9, he rephrased his initial question once more. One more interesting event in the above except is the question from Child Three. Note, at the end of Noor’s reply to Child Two, there is a tag question, “Right?”, to check on whether the audience is following, followed by “Now”. Ordinarily this would function as a discourse marker indicating the start of the next part of the tour (Sinclair & Coulthard, 1975; Pridham, 2001). But, Child Three interrupts Noor to ask one more question before he moves onto a new topic. The child, technically, missed the opportunity to speak (or the TRP) – he even begins his question with a brief apology (“Sorry”). Noor allows the question, answers it, and moves on to the next part of the tour (again using the discourse marker “Now”).

The above excerpt showed a sequence of questions arise after one audience member’s question, but, most often guides *invited* the audiences to ask questions either at the end of a narrative or a tour. In the following example, Joe checks if there are any questions about a just-completed narrative before moving on. Note, that he invites questions and then pauses, providing a space

questions to be asked. He initially gets no response and begins to carry on with the tour, at which point an audience member puts up their hand:

Joe: "…are there any questions in the mean time?" **(invitation)**

Long pause

Joe: "Nothing. OK. Then along comes- (*a hand goes up in the audience*)."

Joe: "Yes, you got a question?" **(acknowledgement)**

Student: *(inaudible)* **(question)**

Joe: "Ja [translation: Yes], all different cultures lived there". **(answer)**

(Joe, Tour One)

Usually when there were no responses to an invitation like this, the guides would prompt for questions again. Often, Noor's prompts even contained hints for questions that could be asked:

"You can ask me anything about District Six... games, gangsters, you name it, right?"

(Noor, Tour Three)

Furthermore, since Joe and Noor give tours so often, they appeared quite familiar with the types of questions most groups ask. Answers to common questions were well-rehearsed and comprehensive while uncommon questions were often answered more briefly. Whenever Noor encountered a question to which he did not know the answer, for instance, he often responded "I don't know, but I'll find out for you". The following excerpt, taken from a question and answer session near the end of Noor's Tour Three, and shows Noor's favouring of well-rehearsed answers which tap into his extended repertoire. When asked about Devil's Peak (lines 2-5) and museum's mural (lines 17-18), which fall outside his repertoire, his answers are brief, or even, incomplete. Conversely, he spends a longer time answering questions about his first car and childhood games, even incorporating more exchanges with the audience while doing so. The excerpt also shows numerous spontaneous audience reactions such as asking questions without prompting (lines 2 and 17), guessing the end of Noor's sentence (line 11), exclamations and gasps (lines 14, 16, 22, 24):

1. Noor: "Ok, now, have you got any questions? Don't be afraid to ask anything, hey." **(invitation)**

2. Child One: "Why did they call the hill Devil's Hill?" **(question)**

3. Noor: "Devil's Hill? There's Devil's Peak, yes, I don't know Devil's Hill." **(reply)**

4. Child One: "Devil's Peak" **(follow-up comment)**

5. Noor: "No, there's a place called Devil's Peak, you know?" **(reply)**

6. ...

7. Noor: “Come, don’t be afraid. Ask the question, come!” **(invitation)**

8. *A child puts of his hand.*

9. Noor: “Daar’s [translation: There’s] a question (*points*)” **(acknowledgement)**

10. Child Two: (*inaudible*) **(question)**

11. Noor: “Oh, my first car, I paid-” **(reply)**

12. Child Two: “Forty Rand?” **(interruption)**

13. Noor: “...I paid a hundred Rand, bought it from my uncle. You can’t even buy a tyre for one hundred Rand today.” **(reply continued)**

14. *Laughter. One child says “Yooo!”*

15. …

16. Child Three: “What’s that mural? (*points to the museum mural*)” **(question)**

17. Noor: “Ok, that’s a mural done by one of our trustees. She’s Peggy Delport.” **(reply)**

18. Noor: “Ok, he’s got a question (*points to another child*).” **(acknowledgement)**

19. Child Four: “What was the favourite games you played?” **(question)**

20. Noor: “Ok, games, ja [translation: yes] right! My favourite game was … marbles … another favourite game was called, unbeentjie … playing in the street. This TV is no good! ... The only thing I watch on TV is the news and my favourite program Sevende Laan[9] [translation: Seventh Lane].” **(reply)**

21. *Uproarious laughter*.

22. Noor: “I love Sevende Laan!”

(Noor, Tour Three)

There were also instances where answering a question would lead to the guides delving into extended repertoire content. Whenever Noor was asked where he moved to when he left District

[9] A popular English and Afrikaans soap opera.

Six – he always answered by explaining that he moved to Athlone and then tells a narrative about how he wanted to move to Sea Point, but was not allowed.

Questions from the Storytellers:
Instances in which the guides asked the audience questions closely resembled Sinclair & Coulthard's (1975) *teacher elicit* or *check* exchanges. Check exchanges are a sub-category teacher elicit exchanges wherein the teacher verifies whether students are following a lesson, often using tag questions such as "Right?", "Hey?" or "OK?". They are not intended to impart information but to establish that the speaker and listener share a mutual view of things. Audiences typically respond to these with "yes's" or head nodding to show acknowledgment. Check exchanges occurred throughout Joe and Noor's. The guides also asked full questions to check that the audience knew what they were talking about. For instance, when Noor is telling about the demolition of District Six, when Noor first mentions a bulldozer, he often asked audiences:

> Noor: "Have you ever seen a bulldozer? (s*cans across the group*)" **(initiation)**
>
> Child: "Yeah." **(reply)**
>
> Noor: "You can see it on that picture there (*points*)." **(feedback)**
>
> (Noor, Tour Three)

Similarly, when he mentions townships he checks with the audience to see if they have heard of them before:

> Noor: "You've heard of Langa?" **(initiation)**
>
> *Yes's and ja's from the group.* **(replies)**
>
> Noor: "Gugulethu, Nyanga and also Khayelitsha, right?" **(initiation)**
>
> *More yes's and ja's from the group.* **(replies)**
>
> (Noor, Tour Three)

Teacher elicit exchanges consist of three parts: the *initiation* in which a teacher/guide poses a question; an audience *reply*; and *feedback* from the teacher/guide. These have also be termed *exchange structures* in which the initiation, reply and feedback make up an *adjacency triplet* of statements that predictably occur together (Pridham, 2001). In Joe's Cape Flats narrative during Tour Two, shown in Figure 4.2, there is one such exchange structure:

> Joe: "And you look at what those roofs are made of?" **(initiation)**
>
> Student: "Asbestos." **(reply)**
>
> Joe: "Asbestos. *All* those roofs…" **(feedback)**
>
> (Joe, Tour Two)

A hallmark of exchange structures are that initiation questions are not asked because teachers, or the guides, do not know the answer. They almost always *know* the answers but are asking questions to engage with the audience and gauge their grasp of lesson content. Exchange structures can follow a number of different paths, all of which we observed in Joe and Noor's tours. In the event that no audience member answers the initiation question, the guides would *re-initiate* by rephrasing or repeating the question:

> Joe: "You know what the word Apartheid means?" **(initiation)**
>
> *No audience response*
>
> Joe: "What's it mean?" **(re-initiation)**
>
> Student: (*inaudible*) **(reply)**
>
> Joe: "Means separation … between white and people of colour." **(feedback)**
>
> (Joe, Tour Three)

In the event of an incorrect answer, guides would give feedback and then prompt the audience for more answers, sometimes providing clues. In the following example, Noor was telling a story about his first job and salary. At first no-one answers his initiation question, leading him re-initiate. When an audience member answers incorrectly, Noor responds "No" and restates part of the initiating question as a clue leading to more answer attempts, including a correct answer:

> Noor: "…now comes Friday. What are you looking forward to now?" **(initiation)**
>
> *Some mumbling*
>
> Noor: "Hey?" **(prompt)**
>
> Child One: "Party." **(reply: incorrect answer)**
>
> Noor: "No **(feedback)**, Friday. **(clue)**"
>
> Child One: "Food." **(reply: incorrect answer)**
>
> Child Two: "Pay day." **(reply: correct answer)**
>
> Noor: "Pay day, pay day! Yo, I was so excited…" **(feedback)**
>
> (Noor, Tour Three)

Where an initiating question had multiple answers, the guides would delay giving feedback, instead responding by listing the answers so far until enough answers had been provided. In the Group Areas and Mixed Marriages narrative, Noor asks the audience to name a number of Cape Town

townships. The following excerpt, he asks for the names of "coloured" townships, and upon receiving one correct answer, he gives positive feedback and names more "coloured" townships. He then starts a second exchange structure asking for the names of "black" townships. Here he solicits multiple answers, listing each correct one and ending the interaction after three correct answers.

O: "So what the government did was, they sent all our, so-called 'coloured' people to the coloured townships."

Exchange Structure:
Noor: "An- do you know any of the townships in Cape Town?" **(initiation)**

Student One: "Mitchell's Plain." **(reply)**

Noor: "Mitchell's Plain is one of them, there's a place called Hanover Park, and Lavender Hill. There's Bonteheuwel, Heideveld, there's about fourteen different areas. Then of course all the Indians, and Hindus, were moved to Rylands and Cravenby, that's an Indian area only." **(feedback)**

Exchange Structure:
Noor: "Now where do you think, where did all the black people go to?" **(initiation)**

Student Two: "Soweto" **(reply)**

Noor: "No, **(feedback)** in Cape Town, in Cape Town. **(clue)**"

Student Three: "Gugulethu." **(reply)**

Noor: "Gugulethu is one of them, ja." **(feedback, listing)**

Student Four: "Khayelitsha." **(reply)**

Noor: "Khayelitsha, Khayelitsha is the biggest area today. They've got more than, one point six million, people living there, today. **(feedback, listing)** There's also…? **(prompt)**"

Student Five: "Langa." **(reply)**

Noor: "Langa was the first area, then Gugulethu, then Nyanga, and then of course after that, Khayelitsha." **(feedback)**

(Noor, Tour Two)

Joe and Noor also used four different kinds of questions to initiate exchange structures. First, and most common, questions testing audience's knowledge; e.g. the above example about Cape Town townships and asking audiences to translate Afrikaans sign text, give the names of Apartheid-era

presidents or definitions for Apartheid. Second, questions testing audience grasp or memory of the story so far, e.g. in Tour One of Noor's Group Areas and Mixed Marriages narrative, after delivering the complicating action he initiated the following two, consecutive exchange structures:

> Noor: "…they couldn't live together because she was?" **(initiation)**
>
> *Noor scans the audience; there is no response*
>
> Noor: "Black. **(feedback)** And he was? **(initiation)**"
>
> *Noor scans the audience; there is no response*
>
> Noor: "Coloured, right?" **(feedback)**
>
> (Noor, Tour One)

The above exchanges were somewhat unusual since no audience member attempted to answer, and, instead of re-initiating Noor provides the correct answer and moves on. However, it is clear that his intention was to test whether the audience recalled the different races of the separated couple.
Third, questions where audiences most likely would not know the answers. These led to guessing games featuring lots of prompting and clue-giving. Only Noor did this, and only with young groups who participated enthusiastically. For example, Noor began Tour Three with a number of guessing games, one of which had the group trying to guess the meaning of his name and what kind of building the museum building was. The fourth type was the only one that deviated from the types of questions that Sinclair & Courtyard observed: questions about the audiences themselves where guides were not asking questions to which they knew the answers and there were no 'incorrect' answers. Here guides asked questions to both involve and get to know their audiences. In the case of the former, we often observed that when Noor would tell a story about how he came to write his book to younger audiences, he would begin by asking who in the group had a good memory, encouraging them to put up their hands so he can count. For the latter, Joe's Tour One, where the audience members all lived in Cape Flats townships, provided an extensive example in which he inquired where everyone lived. This example is more complex than the other exchanges we have explored since it contains banter where Joe displayed his status as a Cape Flats resident, sharing in-jokes and knowledge about specific neighbourhoods:

> Joe: "Where are you guys all staying?" **(initiation)**
>
> *Most of the audience says 'Cape Flats'.* **(replies)**
>
> Joe: "Julle almal innie Cape Flats, (ek) weet julle's almal innie Cape Flats man!" [translation: "You're all in the Cape Flats, (I) know you're all in the Cape Flats man!"] **(feedback, prompt)**
>
> *Joe and audience chuckles, others name specific neighbourhoods.* **(replies)**
>
> Joe: "You Khayelitsha. OK." **(feedback)**

Banter:
Joe: "How long are you staying, living there?"

Student One: "Two years"

Joe: "Hey?"

Student One: "Two years"

Joe: "Two years"

…
Joe directs his attention to another audience member.

Joe: "...OK right. Anybody else?" **(prompt)**

Simultaneous answering amongst audience, someone says "Atlantis" **(replies)**

Joe: "Wie woon in Atlantis?" [translation: "Who lives in Atlantis?"] **(feedback)**

Audience giggles

Banter:
Joe: "Who's livin' in Atlantis? God, julle moet mos a bus en a trein en twee aeropleine vat om hier to kom! [translation: "God, you have to take a bus and a train and two airplanes to get here!"] (*laughs*)"

Audience laughs

Joe: "Jaaass! *(laughs)* Wesfleur? Which part of Atlantis? Wesfleur?"

Student Two: (*nods*)

Joe: "Ah, I thought as much ... it's a hell of a distance..."

Audience laughs

Joe: "…just think three hours of your life is taken away from you just sitting in a taxi. 'Ka-doef!', 'ka-doef!', 'ka-doef!' *(imitating the loud music often playing in mini-bus taxis)*…"

Audience laughs raucously

Joe: "(*chuckles*) But that's a reality that we have been thrown out and living in all those areas, um, it was part of the whole, destruction of people of colour..."

(Joe, Tour One)

As with all guide-audience interactions, exchange structures always took place between clauses. The guides even occasionally used exchange structures to lead into a forthcoming clause. The following example comes at the end of Noor's anecdote about the demolition of his family home. The evaluative content of this narrative conveys his emotional response to witnessing the demolition of his house. Sometimes he ended this narrative by telling of his anger and sadness, but more often he would ask audiences to deduce how he felt. Upon receiving two correct answers, his feedback becomes the narrative's evaluation:

CA: "…the day, they bulldozed *my* home, I was standing there, I was watching them, right in front of me."

Exchange Structure:
Noor: What do you think? How did I feel?" **(initiation)**

Child One: "Sad." **(reply)**

Noor: "Sad." **(feedback, listing)**

Child Two: "Angry." **(reply)**

E: Noor: "Angry, angry, that's the word! Angry! We didn't wanted (*sic*) to go." **(feedback)**

(Noor, Tour Three)

4.3.Summary

In this chapter we describe the outcomes of analysing transcripts of Joe and Noor's personal experience narratives. We wanted to answer two research questions: what kinds of narratives used to convey personal experience and how these narratives incorporated variation and interactions with audiences. Here we summarise our main findings:

1. The guides' personal narratives closely matched to the Labovian structure for personal narratives and fell into the genres of either anecdotes or exempla.

2. The narratives often featured long narrative preconstructions – a sequence of numerous orientation clauses leading up to the narratives main event, the complicating action.

3. Since the narratives were couched in museum tours, they often contained non-narrative factual information. Most often this was contained during the narrative preconstruction, to give full historical context to forthcoming story events.

4. Occasionally, the guides could digress briefly from a narrative's plot to tell a full secondary narrative.

5. Certain narratives were always told together, following a similar sequencing in different retellings. Closer inspection of these revealed that these narratives were linked by a common theme.

6. Narratives were reliably tied to certain objects or locations in the museum. Joe and Noor always told the same the narratives when referring to particular objects, usually photographs with some personal significance to them. In the case of the memory box, Linda allowed the narratives she told to be influenced by which, of the available objects, attracted listener's attention.

7. Narrative structure and content did not vary much across multiple retellings. We were surprised by how similar different retellings were and concluded that, since the guides tell their stories many times over every day, they are well-rehearsed and quite stable.

8. There were minor variations across narrative retellings due to: interaction with audiences; the amount of time audiences were able to spend with the guides; and, to a lesser extent, the incorporation of current events and audience accommodation.

9. Guide-audience interactions *always* took places between clauses, never during.

10. We observed various types of guide-audience interactions, but the most common initiator for interactions, by far, was the asking of questions by both the audience members and the guides.

11. Audience members usually asked questions by putting up their hands and waiting to be called on by the guides. Meanwhile, guides only allowed questions between clauses.

12. The interactions that arose from audience members asking questions took the form of: the guide's *acknowledgement* of a raised hand(s) (where hand raising was involved); the audience member's *question;* and the guide's *reply.* Occasionally audience members responded to the guide's answer, eliciting a second reply from the guide.

13. Often multiple audience questions arose at the end of a narrative or tour. Either an audience question would lead to further questions from other audience members or the guide would invite the audience to ask questions. In the event that audience members did not immediately respond to invitations to ask guides would prompt for questions sometimes giving hints for possible questions.

14. Guides had a tendency to favour commonly occurring questions, to which they gave well-rehearsed, comprehensive answers, while giving more brief answers to less common questions.

15. Guides asked questions to initiate interactions that corresponded to the exchange structures (or teacher elicit exchanges) Sinclair & Coulthard found in classrooms: the *initiation* guides posed a question to the audience; the audience *reply/replies*; and *feedback* from the guide. If audiences did not attempt to answer the initiation question or gave incorrect answer(s), guides re-initiated the exchange by repeating or rephrasing the question or providing answer clues. If the initiation question had multiple answers, the guides solicited multiple answers before giving feedback.

16. The guides asked five different types of initiation question during exchange structures: questions testing the audience knowledge; questions about preceding narrative content; questions audiences most likely did not know the answers to leading to guessing game interactions; questions about the audience members themselves; and questions designed to lead into a forthcoming narrative clause.

The next chapter describes how we applied most of these findings to a novel digital storytelling design.

Chapter 5

Digital Storytelling Design

In this chapter, we detail how we applied Study One's findings to novel digital storytelling design. We embodied our design ideas into a storytelling prototype which presented users with five of Joe and Noor's personal experience narratives. In Section 5.1 we describe how we chose to focus on two main design inspirations, namely simulating the guide-audience interactions we observed and associating narratives with particular objects. Thereafter, three sections describe a different part of our design, each one building on the storytelling prototype's storyboard. In Section 5.2 we describe how we chose the kind of prototype we want to use to embody our designs and the narratives we chose to include. Section 5.3 deals with our first design focus; it describes how we structured digital narratives to accommodate user-storyteller interactions and the design of the interactions themselves. Section 5.4 describes our second design focus: associating narratives with particular objects. Section 5.5 describes the storytelling prototype we created including brief details of its implementation.

5.1. From Ethnography to Design

We discovered many interesting aspects of Joe and Noor's storytelling – more than we were able to discuss in this dissertation. We focused our attention on the kinds of narratives they used to convey personal experience, these narratives' dynamism across retellings and how they incorporated interaction with audiences. Our aim was to use the insights gained in these areas to create an effective, dynamic and interactive digital storytelling user experience. Five findings ultimately contributed to this aim:

1. The fact that narratives were structured as a sequence of clauses
2. Narratives varied very little across retellings; most variation arose as a result of guide-audience interactions
3. Guide-audience interactions only occurred between clauses
4. Guides and audiences interacted most through asking and answering questions
5. Narratives were routinely associated with particular objects in the museum

The first four findings led to our first design idea: the design of digital storytelling which allowed users to interact with a digital storyteller, and these narratives would be dynamic as a result of these interactions. We realised that structuring narratives into its constituent clauses would allow us to create natural spaces (or *turn transition places* as termed by Sacks et. al. (1974)) during which interactions could occur without introducing unnatural interruptions to narrative flow. The interactions themselves predominantly consisted of the asking and answering of questions – either the audience asking the guide a question or vice versa. Certain behaviours facilitated the former; most audiences raised their hands to signal that they wanted to ask a question. Usually at the end of

a long narrative or after completing their core repertoire, guides invited audiences to ask multiple questions. Furthermore, the guides were well-familiar with questions that audiences typically asked and so, their answers were well-rehearsed. Occasionally, they even favoured common questions over unusual ones giving more comprehensive answers to the former and brief answers to the latter. Drawing from this, we decided to create digital storytellers capable of answering a repertoire of typical questions and hoped this would satisfy most users' questions. When the guides asked audiences questions, there followed predictable patterns of turn-taking which closely teacher-student interactions called *exchange structures* (Sinclair & Coulthard, 1975; Pridham, 2001). The guides would pose an initiating question and then responded to and encouraged answer attempts from the audience until they reached one or more correct answer. During the course of responding to answer attempts, the guides steered audiences towards the correct answer(s) by responding to incorrect, or no, answer attempts by re-stating the question, encouraging more answer attempts and giving clues.

The fifth finding above led to our second design idea: to associate narratives with certain objects. The storytelling we observed in Study One took place in a museum - a setting filled with textual information, photographs and objects. Since Noor and Joe were museum guides, it was evitable that these exhibits would be incorporated into their tours. However, they mostly incorporated objects that particularly interested them or related to their personal experience. They always associated the same objects and narratives with each other. Linda's memory box (see Chapter 3, Section 3.4) took this further: not only were narratives and objects associated with each other, but she selected which narratives to tell according to which objects, from a range of possibilities, attracted listener's attention. Thus, one could say the objects acted as triggers for narratives. In the next section we elaborate on how we translated these findings discussed in this section into digital storytelling design.

For our collaborators, the District Six Museum, we hoped our work would contribute towards the long-term preservation of ex-residents' *storytelling* (as opposed to narrative content alone). Therefore, we sought out input from museum management, curators and the guides at various stages of the design and implementation to ensure we were designing a fair representation of ex-resident's storytelling.

In the next section, we describe how we chose narratives to work with and our decision to present these in a simple virtual environment (VE) with storyteller agents modelled after Joe and Noor. We also describe how we began creating a storyboard to visualise our design.

5.2. Choosing an Application Type and Narratives

Since our aim was to capture something of the experience of listening to Joe and Noor in-person. So, we did not want remove their narratives too far from their originating context. Therefore, we chose to create a virtual environment (VE) containing two storyteller agents, one based on Noor and one on Joe, together with the objects their storytelling incorporated. The purpose of this VE was to test the effectiveness of interactive digital storytellers and anchoring narratives in virtual objects.

However, the designs we describe in this chapter are orthogonal to a VR implementation and could be used in other kinds of implementations. Moreover, we focused on designing of user-storyteller interactions and story-related objects rather than producing a high-fidelity VE. Additionally, we planned to evaluate an eventual prototype in a series of experiments. For simplicity, and to ensure a controlled evaluation, we conceived our design as single-user experience. But, since Joe and Noor usually speak groups of visitors, we decided our VE should include some audience avatars who would listen to the storyteller agents along with the user and participate in the interactions where appropriate (more on this later, in Section 5.2.2).

5.2.1. Choosing Five Narratives

One of our earliest observations regarding Joe and Noor's tours was that they had a stable repertoire of narratives. We describe those told in almost every tour as making up their *core repertoire*, and those only told sometimes as making up their *extended repertoire*. We presumed that core repertoire narratives were essential for conveying the experience of forced removals. Conversations with Joe and Noor confirmed that these narratives were personally important to them and had proven most effective for drawing audience reactions. In Study One we selected the five most frequently told core narratives to analyse in detail. These included two of Noor's more lengthy narratives, namely the *Group Areas and Mixed Marriages Acts* narrative (described in Chapter 4, Section 4.1) and one about Noor's family history and home starting with the arrival of his immigrant grandfather in District Six and ending with the demolition of his District Six family home (referred to as the *Family History and Home* narrative in this chapter). We selected three of Joe's narratives, including the *From Bloemhof Flats to Cape Flats* narrative (described in Chapter 4, Section 4.1). Two shorter narratives: one about the demolition of Richmond Street and another about the wording of public Apartheid-era signs; we will refer to these as the *Richmond Street* and *Public Signs* narratives. These narratives were among those the guides told most often, hence they were well-rehearsed and their structure and content remained remarkably stable across retellings. Hence, we could ensure our design presented them in a way that was representative of how they were typically told by Joe and Noor. This included retaining their distinctive characteristics such as the incorporation of background information, occasional digressing to tell secondary narratives and telling series of thematically related narratives consecutively.

5.2.2. Creating a Virtual Environment Storyboard

To guide the implementation of a prototype we created a simple storyboard. Storyboards are typically a pre-production planning device used in film to visualise planned scenes and determine the specific resources required, such as lighting and camera lenses (Katz, 1991). They usually consist of a sequence of annotated sketches, representing a sequence of shots, each describing a shot's requirements including specifications for cinematography, sound, editing transitions and mise-en-scene (setting, costumes, acting and lighting) (Bordwell & Thompson, 2004). VR users are typically free to move and look around a virtual space, so it is not possible to define precisely what they will see as one can with a film's shots. Thus, we adapted the typical storyboard form to specify what users would typically experience upon our VE's start-up and during the narratives. This was useful in defining the desired user experience and details such as the textures and audio required.

The first part of our storyboard was a floor plan, shown in Figure 5.1, specifying the layout of a simple room containing two storyteller agents, objects, virtual audience and the user's starting position. The two storyteller agents were surrounded by the objects referred to during the five narratives we selected. Noor spends most of his tours sitting on a bench in front of a wall of photographs, while Joe usually stood throughout his tours, either at the swivel panels or at the museum's Decay and Demolition exhibit. Therefore, we planned to have a Noor storyteller agent on a bench in front of a wall of Noor's photos, namely a photo of his former District Six home, his infant son and, from his book, photos of his grandparents. We planned a Joe storyteller agent, standing, surrounded by two photographs of his former home, Bloemhof Flats, one of which showed it being demolished, two Apartheid-era public signs and a Richmond Street panel. For the latter, we wanted to imitate the museum's two-sided panel, where one side shows 1960s Richmond Street and the other shows the present-day, razed area where Richmond Street once was. The "User" label in Figure 5.1 indicates the user's starting position, while the "A" labels show the placing of audience avatars. The user was free to move around the VE as they wished, hence, we chose to keep the room simple and locate the storyteller agents and objects close together in an effort to keep the user close to both storyteller agents and, hence, their storytelling.

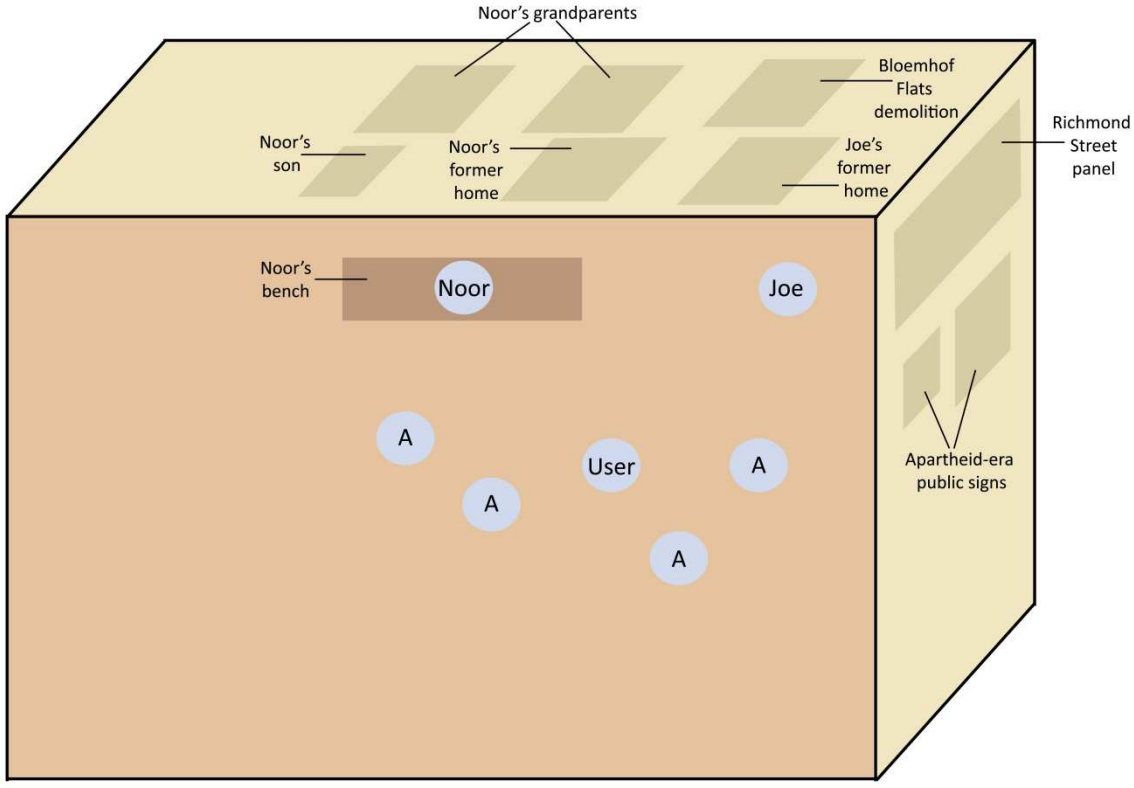


Figure 5.1 The floor plan, in bird's eye view, of the VE we set out to create. It shows the floor and two walls (right and top) of the simple room. The storyteller agents are marked "Noor" and "Joe", "User" indicates the user's starting position and audience avatars are marked "A". We decided to place the Noor storyteller agent on a wooden bench modelled after the bench Noor usually sits on during tours. Meanwhile, the Joe storyteller agent, like Joe, would stand throughout narration. The two walls near the storyteller agents were to contain a number of objects from the museum which Joe and Noor often referred to during the five narratives we selected for our prototype.

The second part of our storyboard, borrowing from the annotated sketch form of film storyboards, consisted of a short series of sketches specifying what users would typically see upon the VE's start-up and during the storytelling. The sketches were annotated with requirements for setting, lighting and audio, as well as VR-specific requirements: possible interactions; avatars and agents specifications; and any additional effects or user options. The first sketch, Figure 5.2, shows what users would first experience upon start-up, namely, two storyteller agents, standing in a simple room, with an aesthetic reminiscent of the District Six Museum's main hall, in front of a number of audience avatars seated on the floor. The user is free to move and look around and can press a key to sit on the floor. If they are sitting they cannot move around unless they press the same key to stand up again. We further decided that shortly after start-up, the storyteller agents would introduce themselves, just as Joe and Noor at the start of a tour. Thereafter they would begin telling their narratives, one after the other, with a pause of a few seconds in-between.

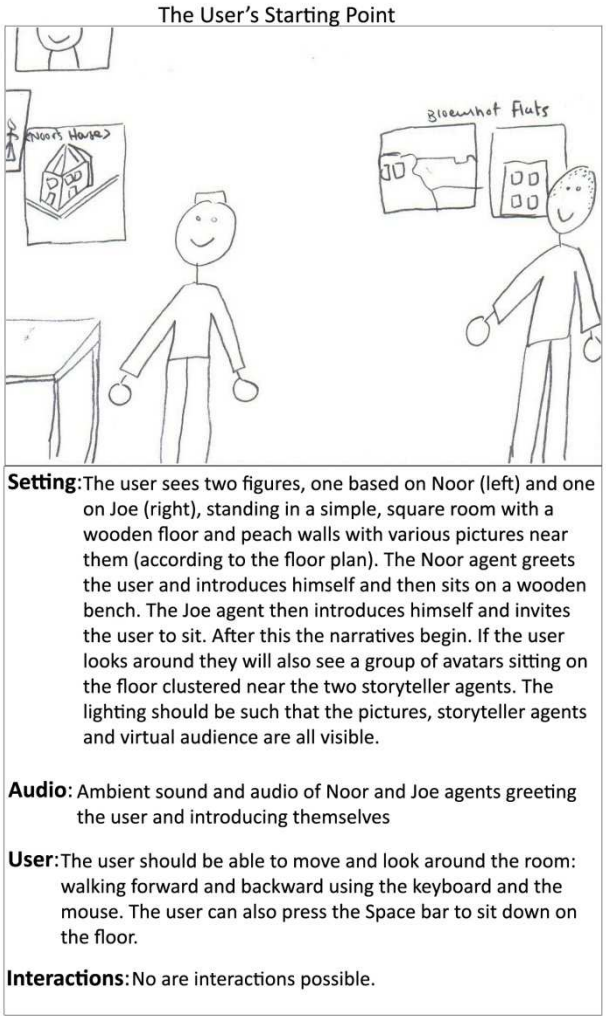
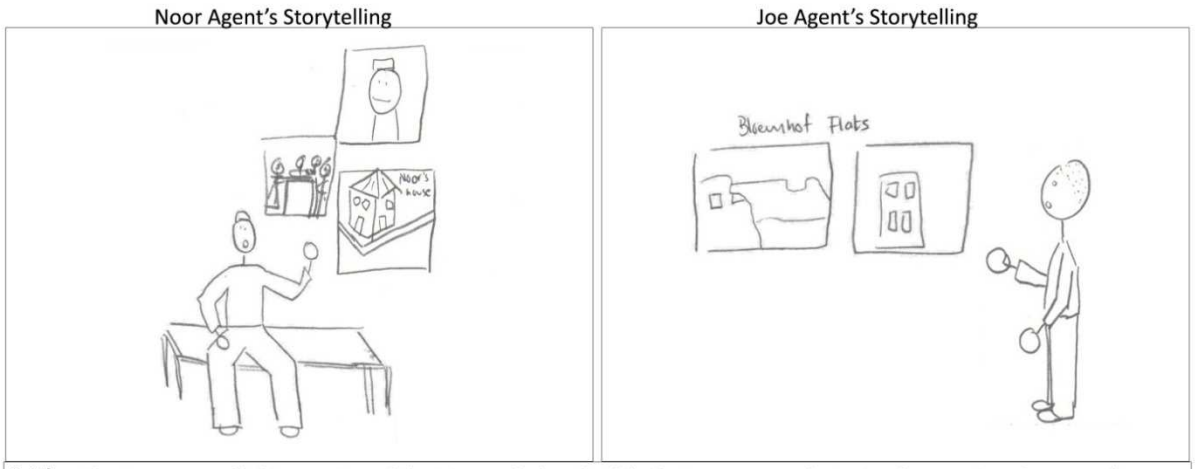


Figure 5.2 An annotated sketch from our VE's storyboard showing what the user would experience at the start of our prototype's VE.

Figure 5.3 shows our initial ideas of what users would experience during the narratives, namely audio of Joe and Noor's voices, animated storyteller agents and the possibility of interacting with the agents by asking questions and participating exchange structures. When all five narratives finished, the VE's light would fade down gradually and the prototype would exit automatically.



Setting: The Noor agent tells his narratives while sitting on the bench while the Joe agent stands. During the narrations the storyteller agent models should be animated in a way that matches the audio and that is someewhat typcial of Joe and Noor's movements during their tours at the District Six Museum (e.g. Joe often clasps his hands while Noor often leans towards the audience when making important points). The storyteller agents should also point towards the photographs on the walls near them at appropriate points duiring the narratives. When all five narratives are finished the lighting should fade down gradually to black, to indicate the experience is finished, and the VE should exit automatically.

Audio: Ambient sound. And audio of Noor and Joe's storytelling; when one narrative ends there should be a pause of a few seconds before the next narrative begins.

User: As at the start of the VE, the user is able to move and look around the room and sit of the floor.

Interactions: **(1)** Any point during a narrative the user is able to put up their hand in the VE to signal their desire to ask a question; there should be some reminder on the screen that this possible, and, if the user does put a hand, that reminder should be removed and replaced with a visual indicator that their hand is up. When the storyteller agent acknowledges the hand-up, the user should be provided with a means for inputting their question - possibly an area in which they can type. Once a question is entered, the input area should be removed and and the storyteller agent should give an appropriate response before returning to the current narrative. Additionally, there will be points at which storyteller agent will invite the user to put up a hand to ask a question.

(2) There will also be points at which the storyteller agents will ask the user a question. When this happens the hand-up reminder mentioned in (1) will no longer be displayed. After a storyteller agent asks a question, the user should be provided with a means of inputting an answer. When the user enters input, the input area should be removed and the storyteller agent should give an appropriate response: if the user has supplied the correct answer the interaction ends, otherwise the storyteller agent prompts for another answer and the user is, once again, allowed to input an answer. The user should also be able to choose to not answer the question and, if they do, one of the virtual audience members will be heard giving answers instead.

Figure 5.3 An annotated sketch from our VE's storyboard showing the VE during the narratives including our initial ideas regarding the user-storyteller agent interactions.

The floor plan and annotated sketches served as an early starting point in our design process, helping us to begin conceiving of how to present users with Joe and Noor's narratives and while incorporating interactions. Furthermore, they allowed us to communicate a brief, but concrete idea of what we were planning on creating to the museum staff and, especially, Joe and Noor themselves. We consulted the museum early on in our design process to ensure that the setting and application type we had chosen would facilitate a representation of Joe and Noor's storytelling that was as faithful as possible. We were able to confirm that the narratives we had chosen were ones that the guides would consider as part of their core repertoire and the storyboard was accepted as an accurate translation of the Joe and Noor's storytelling at the museum. The complete design for the delivering the narratives while incorporating user-storyteller agent interactions, however, was better visualised using narrative structure diagrams (like those in the previous chapter) and state diagrams. These made up the rest of our storyboard and are presented in the next section.

5.3. A Design for Interactive Digital Narratives

As mentioned in Section 5.1, we found that personal narratives consisted of a sequence of clauses, and audience-storyteller interactions always took place between clauses. We decided to mimic this in our design. And, we focused on mimicking the two kinds of interactions which were most prevalent: audiences asking the guides questions and the guides posing questions to audiences. Audience's questions tended to be preceded by audience members raising their hands and waiting to be called on by the guides, or by guides encouraging multiple questions, usually at the end of narratives. We refer to the former as a *user question* and the latter as a *question opportunity*. Borrowing from the work of Sinclair & Coulthard (1975), we use the term *exchange structures* to describe the interactions where a storyteller asks the audience a question. So, according to Dautenhahn's classification, we were designing Type II storyteller agents which could tell stories and were capable of human-like interactions by drawing from a collection of pre-specified narratives and responses (Dautenhahn, 1998).

We divided the five narratives we were working with into their constituent clauses. Recall that, in Study One, we identified each of the five narrative's clauses, in a variety of retellings, and identified guide-audience interactions that arose. Here we refer to these collectively as a narrative's *components*, of which there are three types: non-interactive, static *clauses*; and interactive *question opportunities* and *exchange structures*. With this arrangement we could ensure that interactive components never took place during clauses. It also facilitated user questions. We chose to allow users to signal their desire to ask a question, by virtually raising a hand, at any point during a narrative. Then, at the end of every component, the storyteller agent would check for a hand-up from the user – if there was one, a user question interaction could take place before moving on to the next component. We designed the rendering of a narrative as a state machine with four parts: the first to handle rendering a narrative as a sequence of components; the second to handle user questions; the third, question opportunities; and the fourth, exchange structures.

5.3.1. A Narrative as a Sequence of Components

Figure 5.4 shows the design of the *Narrative* state machine for processing a sequence of a narrative's components while incorporating user questions that arise. It begins by determining the type of the first component's type and choosing the correct state: *Clause*, *Question Opportunity* or *Exchange Structure*. Clauses are static; they deliver a part of the story in the same way every time they are "played". Question opportunities and exchange structures, are interactive and each lead to different state machines: *Question Opportunity* and *Exchange Structure* respectively, which we elaborate on later. The completion of a component leads to the *Turn Transition Place* state where, before moving on to the next component, the storyteller agent checks whether the user's hand is up. If there is, the machine moves to the *User Question* state machine. When *User Question* completes, the machine moves to the *Next Component* state where the type of the next component is determined. If there is no user hand-up, however, the machine moves directly to *Next Component*. This process repeats until all of the narrative's components have been completed.

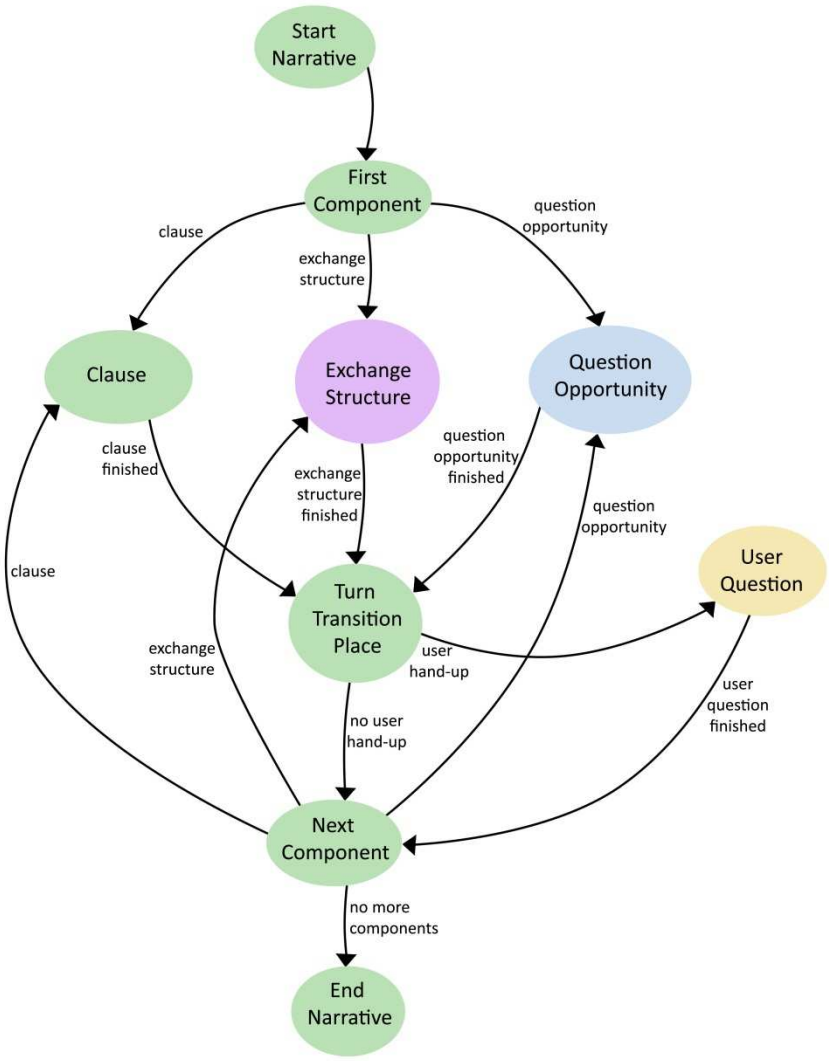


Figure 5.4 The state machine for processing a narrative as sequence of three types of components: static Clauses and interactive Question Opportunities and Exchange Structures. It begins, in First Component, by deciding the first component's type and selecting the appropriate way to deliver it. The Question Opportunity and Exchange Structure states represent further state machines (given in Figures 5.8 and 5.9, respectively). Each subsequent component is similarly processed, one at the time. The end of every component leads to the Turn Transition Place state where, if the user's hand is up, the machine moves to User Question – a state machine (given in Figure 5.7) which allows users to input a question to the storyteller agent. If there is no hand-up, Turn Transition Place leads to Next Component where the next component's type is determined next state chosen accordingly. Once all the components are complete, the narrative ends.

Choosing the Narratives' Components:

In deciding each narrative's constituent components, we drew from our Study One analysis of their structure over multiple retellings. Since the narratives were quite consistent across retellings, we could deduce the structure of typical retellings. Our digital version of each narrative took the form of the most often told clauses, thus, where we found variation across retellings we chose the structure that appeared in the most retellings. We also aimed to recreate as many of the guide-audience interactions that arose in our transcripts of the narratives. Any questions that arose were used to create the storyteller agents' question repertoires. If any of a narrative's retellings contained a question opportunity where the guide encouraged or allowed the audience to ask multiple questions, we added one to the digital version as well. Regarding exchange structures, we found the

guides made use of different types of initiating questions: ones that tested the general knowledge; questions about preceding narrative content; questions that required audiences to use common sense or guessing to answer; and questions about the audience members themselves. We chose to recreate all of these types except for the last since, when the guides asked questions about the audience members, for example, where they live or whether they had seen bulldozer before, there was no "correct answer" as there were with the other questions. Rather, answers related to the listeners, making them difficult to simulate without gathering information about the user.

As examples, we will describe how we derived the components for the two narratives described in detail in the previous chapter: Noor's *Group Areas and Mixed Marriages Acts*, for which we had transcribed three retellings; and Joe's *From Bloemhof Flats to the Cape Flats*, for which we had four. *Group Areas and Mixed Marriages Acts* was characterised by a long narrative preconstruction (numerous orientation clauses leading up to the narrative's complicating action), which contained the only two variations found across the three retellings. First, the narrative began by describing the declaration of District Six as a whites-only neighbourhood. In two retellings, this was elaborated on as a full anecdote, while Tour Two simply gave the date of the declaration. We chose the full anecdote structure which appeared in Tours One and Three. Second, Tours One and Three featured eight orientation clauses, while Tour Two, had seven. The clause omitted from Tour Two referred to Edith, a museum employee and we noted that Noor only mentioned this clause when Edith was present. Since we did not plan to include a digital version of Edith in our VE, it made sense to omit this clause. Apart from these variations, this narrative was identical in Tours One, Two and Three, all of which featured a complicating action, and combined evaluation and result, clause. Thus, we retained this structure for the digital version.

The interactions in this narrative were different in all three retellings, and we chose to recreate as many as possible. As in Tour One, we included a question opportunity at the narrative's end. In Tour Two, Noor initiated an exchange structure in which he asked the audience to name Cape Town townships. Closer inspection showed that this interaction actually comprised two consecutive exchange structures. In the first, Noor asked the audience to name townships where coloured people were made to live. After he received a number of correct answers he initiated a second exchange structure by asking them to name townships allocated for "black people". Similarly, in Tour One there were two consecutive exchange structures in which Noor asked the audience about the races of the multi-racial couple who were separated under the Mixed Marriages Act. Figure 5.5 shows the resultant component structure we used for this narrative.

Joe's *From Bloemhof Flats to the Cape Flats* narrative consisted of a series of three, related narratives about the transition from District Six to the Cape Flats townships. In three of the four transcribed retellings the three narratives occurred in the same order, so we used this order in our version. The structure for the first narrative was the same in Tours Two, Three and Four, while Tour One differed only by one clause[10]; we used the more prevalent structure. The structures of the second and third narratives were identical in all four retellings. Only Tour Two contained interactions, namely a question from the audience and an exchange structure. With the audience question, which occurred at the end of the whole narrative, we decided to create a question

[10] The structure in Tours Two, Three and Four was *Orientation – Complicating Action – Evaluation and Result – Evaluation and Result* whilst Tour One's rendition excluded the second *Evaluation and Result* clause.

opportunity. In the exchange structure, Joe asked the audience about the consequences of the asbestos which we planned to imitate. Figure 5.6 shows this narrative's component structure.

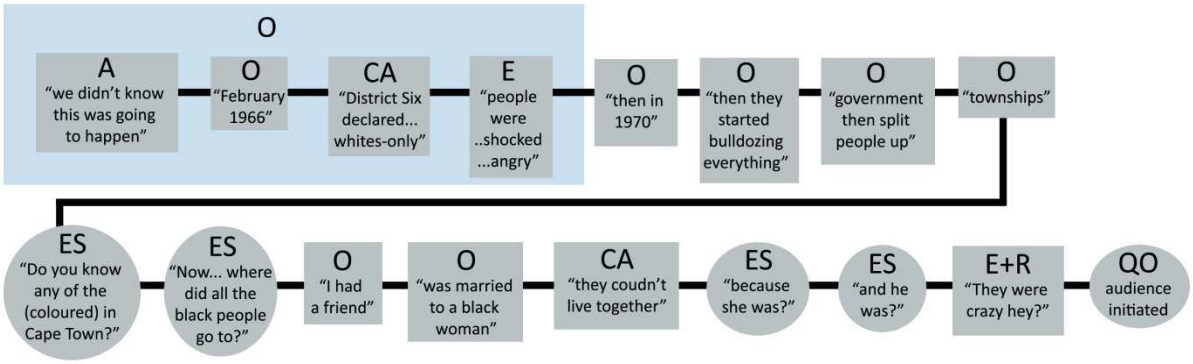


Figure 5.5 The component structure used for Noor's Group Areas and Mixed Marriages Acts narrative. Rectangles represent clauses and are labelled with quote from the original narrative and clause name: A (abstract); O (orientation); CA (complicating action); E (evaluation) and R (result). Circles represent interactions: ES (exchange structures) are shown with their initiating questions; QO (question opportunities) include an indication of whether they were initiated by a virtual audience member asking a question or by the storyteller agent inviting questions. This structure was derived by inspecting this narrative's structure over three retellings (see Figure 4.1, Chapter 4). We selected the most commonly occurring clauses and ordering and aimed to recreate the interactions from all three retellings.

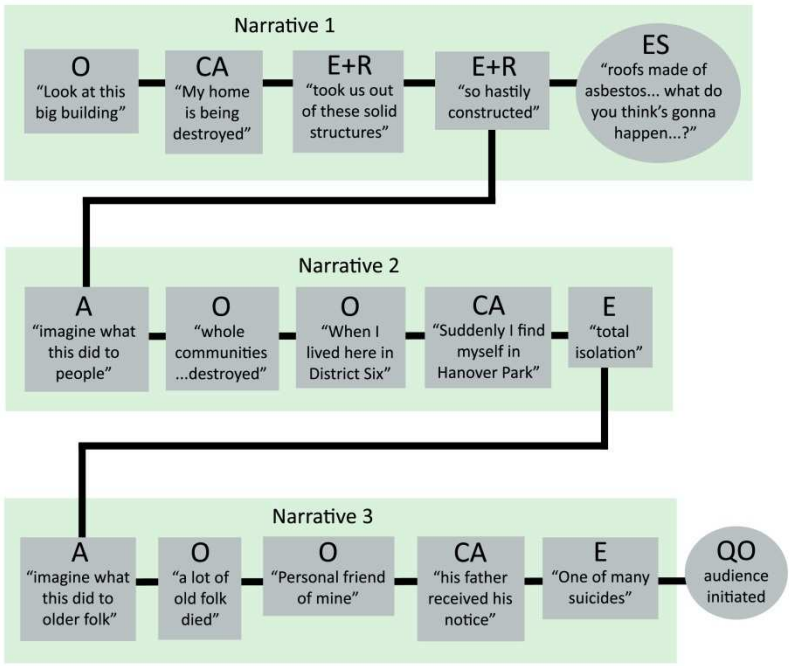


Figure 5.6 The component structure used for Joe's From Bloemhof Flats to the Cape Flats narrative. Rectangles represent clauses and are labelled with quote from the original narrative and clause name: A (abstract); O (orientation); CA (complicating action); E (evaluation) and R (result). Circles represent interactions: ES (exchange structures) are shown with their initiating questions; QO (question opportunities) include an indication of whether they were initiated by a virtual audience member asking a question or by the storyteller agent inviting questions. This structure was derived by inspecting this narrative's structure over four retellings (see Figure 4.2 and Figure 4.3 in Chapter 4). We selected the most commonly occurring clauses and ordering and aimed recreate the interactions from all four retellings.

5.3.2. User Questions and Question Opportunities

For user's questions, we selected a simple implementation inspired by our observations of how the guides handled questions. Our design provided two ways for users to input questions: *User Questions* where the user could signal their desire to ask a question at any stage during a narrative and *Question Opportunities* where storyteller agents allow multiple questions to be input.

Creating & Accessing a Question Repertoire:

A first step was to establish a repertoire of questions each storyteller agent could answer. We conceived of questions as a pairing of audio recordings: one of an audience member asking the question and one of Joe or Noor answering that question. If a question was asked by a virtual audience member, the user would hear both recordings – the first followed by the second. If a user asked the question, they would hear only the answer recording. The problem of parsing user input to determine an appropriate and useful agent response has been explored in artificial intelligence work (see Section 2.3). However, in our work we opted to use a keyword-matching technique. Each question in the storyteller agents' repertoires were associated with a keyword set, and user inputs were compared to the keyword sets of each question to determine which question their input appeared to resemble most (more on this in Section 5.5.1 below). This choice partially stemmed from our ethnographic observations of Joe and Noor answering audience questions (see Section 4.2.2). They tended to stick to a repertoire of well-rehearsed answers to often-asked questions, and when they encountered more uncommon questions gave comparatively brief answers or stated that they did not know the answer.

Finally, it would not be realistic for the storyteller agents to repeat an answer recording, so each question could only be 'used' once. Therefore, once a question had been asked, whether by the user or virtual audience, and answered it would be removed from the storyteller agent's question repertoire. We populated the each storyteller agent's repertoire using all the questions that arose during our recordings of the five narratives. On a practical note, these were the questions for which we had recordings of Joe and Noor's answers. Furthermore, each question opportunity was associated with a collection of the questions which related to the narrative in which they were contained. Each storyteller agent's complete question repertoire consisted of all the question opportunity questions combined. Using this method, the Noor and Joe agents were able to answer six and three questions respectively. Even though these repertoires were finite, these answers satisfied the questions that arose during these narratives amongst the museum visitors; we hoped they would, similarly, satisfy most users' questions.

User Question State Machine:

The state machine represented in Figure 5.4 above, checks, after each narrative component, whether there is a user hand-up. If so, the user question state machine in Figure 5.7 is initiated. First the storyteller agent acknowledges that the user has a question (e.g. Yes?", "Yes, you have a question?" or "You may ask your question") in the *Storyteller Agent Acknowledges User* state. The user is then allowed to input their question (*User Input Active*). During this time the user may opt out of inputting a question, leading to the end of the interaction (*End User Question*). Additionally, we did not want the storyteller agents to wait indefinitely for input, so there is a time limit; if the user enters no input within it the machine moves *End User Question*. If the user enters a question, or has typed partial input within the time limit, the storyteller agent parses whatever has been entered

in *Storyteller Agent Response*. Here, the storyteller agent attempts to 'recognise' the input by comparing it to the questions in its repertoire. If a match is found, the question is answered (*Recognised Question Response*). Otherwise, the question is regarded as 'unrecognised' and the agent responds by saying that they don't know the answer (*Unrecognised Question Response*). After the storyteller agent has responded, the interaction ends and they return to the narrative as per Figure 5.4. A key part of user questions is that users can put up a hand at any point during a narrative. To ensure that users were always aware of this option, we decided that there should be an on-screen reminder during narratives. But, if all of the storyteller agent's questions have been 'used', inputting any further questions would inevitably lead to the *Unrecognised Question Response* state. So, when all possible questions are exhausted, the ability to put up a hand would be removed along with the reminder.

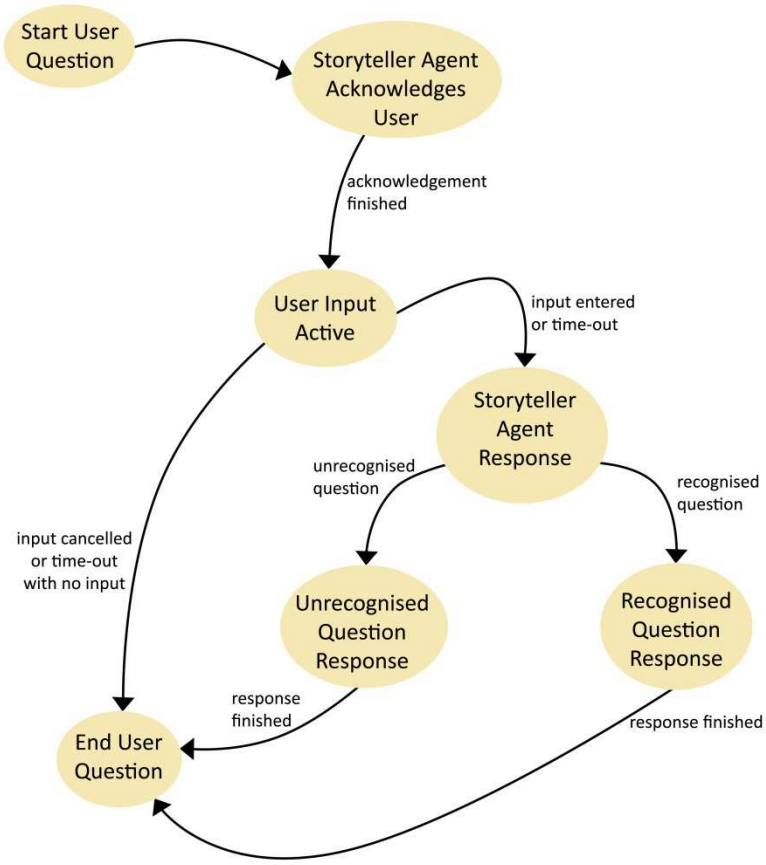


Figure 5.7 The *User Question* state machine: First, the storyteller agent acknowledges that the user has a question in *Storyteller Agent Acknowledges User*; the user is then allowed to input their question during *User Input Active*. The storyteller agent waits for a reasonable amount of time for this input before there is a time-out. If, at the time-out, no input has been entered, or if the user cancels the question, the interaction ends. If the user enters input or, at time-out, there is partial input, the machine moves to *Storyteller Agent Response* where the storyteller agent parses the input and attempts to match it to a question in its repertoire. If a match is found the storyteller agent answers the question (*Recognised Question Response*). Otherwise, storyteller agent indicates that they don't know the answer (*Unrecognised Question Response*). Both these lead to the end of the interaction.

Question Opportunity State Machine:

Question opportunities could be initiated in two ways: by the storyteller agent inviting the user and virtual audience to ask questions or by a virtual audience member asking a question leading to more

questions to be accepted by the storyteller agent. We selected the means in which we would initiate question opportunities based on how they initiated in the tours we were drawing from. For instance, the question opportunity in the *Group Areas and Mixed Marriages Acts* narrative was based on one initiated by an audience member's question, so we mimicked this in our prototype. Question opportunities initiated by the storyteller agent, are additionally associated with a collection of *invitations*, which are recordings of Joe or Noor prompting the audience to ask questions. To ensure that the storyteller agent did not repeat the same invitation, each one could only be used once.

Recall that a storyteller agent's question repertoire consists of all the questions in its question opportunities combined. Therefore, it is possible for a question opportunity's questions to be exhausted before it has even taken place via answering prior questions from the user. Figure 5.8 shows that the question opportunity state machine starts by first checking whether the question opportunity has any unasked questions. If it does the question opportunity, continues and, if not, it ends immediately. In *Initiate Question Opportunity*, the machine checks whether the question opportunity has a collection of invitations. A lack of invitations indicates initiation via a virtual audience question, while the presence of invitations indicates initiation by the storyteller agent. In the former case, the storyteller agent acknowledges a virtual audience member's question (*Storyteller Agent Acknowledges Virtual Audience Member*), a virtual audience member then asks a question (*Virtual Audience Member Asks a Question*) drawn from the question opportunity's collection leading to *Recognised Question Response.*

Otherwise, the machine goes to the *Storyteller Agent Invites Questions* state which leads to the *Floor Open* state, where the storyteller agent waits for the user to put up a hand. During this time a prompt is displayed to the user, just like the one used during narratives, to remind the user that they can put up their hand. The storyteller agent waits for a limited time and, if the user does not put up a hand, it takes a question from the virtual audience instead. This ensures that users are given an exclusive opportunity to ask a question and the virtual audience only asks questions if the user does not put up their hand within the *Floor Open* time limit. If the user does, put up a hand, the machine follows the same design used in the *User Question* state machine (namely moving through the *Storyteller Agent Acknowledges User Question, User Input Active*, *Storyteller Agent Response*, *Recognised Question Response* and *Unrecognised Question Response* states), with only the two differences. First, if the user cancels their question or allows the question input to time-out with no input, a virtual audience member will ask a question. This ensures that the question opportunity does not end if the user opts not to input a question after all. Second, in searching for a match to the user's question, the machine first attempts to the match it to question within the current question opportunity. If no match is found, it searches the storyteller agent's other question opportunities.

Upon concluding a question response, the machine moves to *Next Question* where one of three things may happen: (a) if there are unused invitations and questions, the storyteller agent invites more questions (*Storyteller Agent Invites Questions*); (b) if there are unused questions, but no invitations (either because they have exhausted or the question opportunity did not have any to begin with) the machine moves to *Floor Open*; (c) if all the questions have been exhausted, the question opportunity ends.

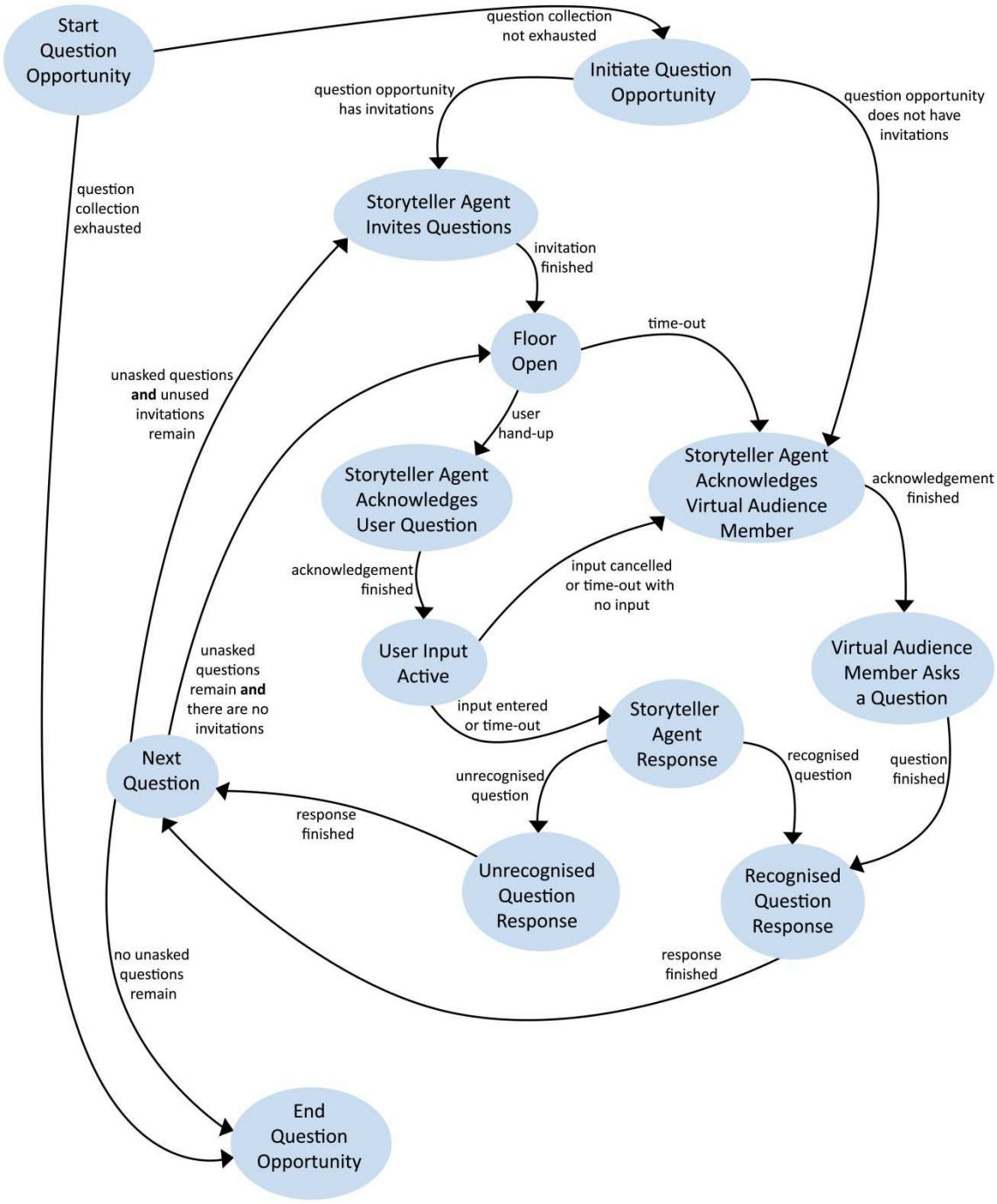


Figure 5.8 The *Question Opportunity* state machine starts by checking whether its question collection has been exhausted during earlier questions. If so, the question opportunity is not initiated. Otherwise, Initiate Question Opportunity and checks whether there is a collection of invitations. If not, the question opportunity is initiated via a virtual audience member question (*Storyteller Agent Acknowledges Virtual Audience Member, Virtual Audience Member Asks a Question* and *Recognised Question Response*). If there are invitations, the *Storyteller Agent Invites Questions* and then waits, in *Floor Open*, for a user hand-up. A user hand-up leads to *Storyteller Agent Acknowledges User Question* and, then, *User Input Active*, where the user may input their question. If the user cancels or enters nothing, the machine moves through *Virtual Audience Member Asks a Question* and *Recognised Question Response*. If the user enters input, the storyteller agent attempts to find a match (*Storyteller Agent Response*). A match leads to *Recognised Question Response*. Otherwise, the storyteller agent indicates that they don't know the answer in *Unrecognised Question Response*. The completion of question responses leads to *Next Question* from which either: (a) the storyteller agent invites more questions; (b) the floor is opened; or (c) the question opportunity ends.

5.3.3. Exchange Structures

Recreating an exchange structure required defining an initiating question, to be asked by the storyteller agent, with one or several correct answers. As the guides in Study One did, the storyteller agent attempts to steer users toward correct answers until they reach the one correct answer or gives enough of several correct answers. To achieve this, our exchange structures were associated with a *terminating answer* and, a collection *non-terminating answers*. When the former is supplied, the interaction concludes. Meanwhile, non-terminating answers lead to the storyteller agents giving feedback on those answers, encouraging further answer attempts and, possibly, providing clues. When an initiating question had only one correct answer, it would serve as the terminating answer and the non-terminating answers would be an assortment of incorrect answers. When there was more than one correct answer, the terminating answer could be any correct answers, while non-terminating answers could be a mixture of correct and incorrect answers. Each answer was associated with a set of keywords used to judge which answer a user's input most resembled. We also wanted to ensure that no response from the storyteller agent repeated, so once an answer has been provided and responded to, it is regarded as 'used'.

Figure 5.9 shows the exchange structure state machine. It begins with the storyteller agent posing an initiating question (*Storyteller Agent Initiates*). The user can then input an answer attempt (*User Input Active)*. Here we made use of the same time-out algorithm used for questions: the user is given a reasonable time limit for input and is able to cancel if they do not wish to attempt an answer. If the user enters input, the state machine moves to *Storyteller Agent Response*, from which there are three possible paths depending on the user's input: (a) if it matches the terminating answer, the storyteller agent gives an appropriate response (*Terminating Response*) and the exchange structure ends; (b) if it matches a non-terminating answer, the storyteller agent gives a response specific to that answer (*Non-Terminating Response*); and (c) if it does not match any of the exchange structure's defined answers, it is regarded as unrecognised leading to a generic response along the lines of "No, try again" (*Unrecognised Input Response*). If the user cancels or inputs no answer, the virtual audience provides an answer instead (*Virtual Audience Answer*). Thus, users have an exclusive chance provide an answer; only if they forgo it, does the virtual audience offer an answer. When this happens, the state machine ensures that the virtual audience does not prematurely end the exchange structure by providing the terminating answer. If there are unused non-terminating answers, the virtual audience will offer one of those (*Non-Terminating Answer* and *Non-Terminating Response*). Otherwise, they provide the terminating answer (*Terminating Answer* and *Terminating Response*). Finally, to avoid an indefinitely long interaction due to users repeatedly inputting non-terminating or unrecognised answers, we chose to limit user answer attempt to three. Therefore, after *Non-Terminating Response* or *Unrecognised Input Response*, the machine moves to *Count User Attempts* where the user's answer attempts so far are tallied. If the user has exceeded the limit, a virtual audience member provides the *Terminating Answer* and, consequently, ends the exchange structure. If the user has not yet exceeded the limit, they are, once more, able to input an answer in *User Input Active.* Our exchange structures are not unlike the involvement questions implemented by Yamazaki et. al. (2009) (see Chapter 2, Section 2.4) where a robot posed questions to museum visitors and then waited a certain amount of time before giving an answer. However, the robot did not 'listen' to visitors' spoken answers and gave the same response regardless of their answers. We attempted to take this type of interaction further by designing truly interactive exchange structures respond directly to user's answer attempts. Additionally, they are similar Graesser et. al.'s (1999;

2005) work (see Chapter 2, Section 2.3) on interactive tutoring agents which posed a series of questions and problems and used conversational turns to guide users to the correct answers. However, their work focused on lengthy interactions whereas we aimed to weave fairly short interactions into narratives in the same way as Joe and Noor did during their storytelling.

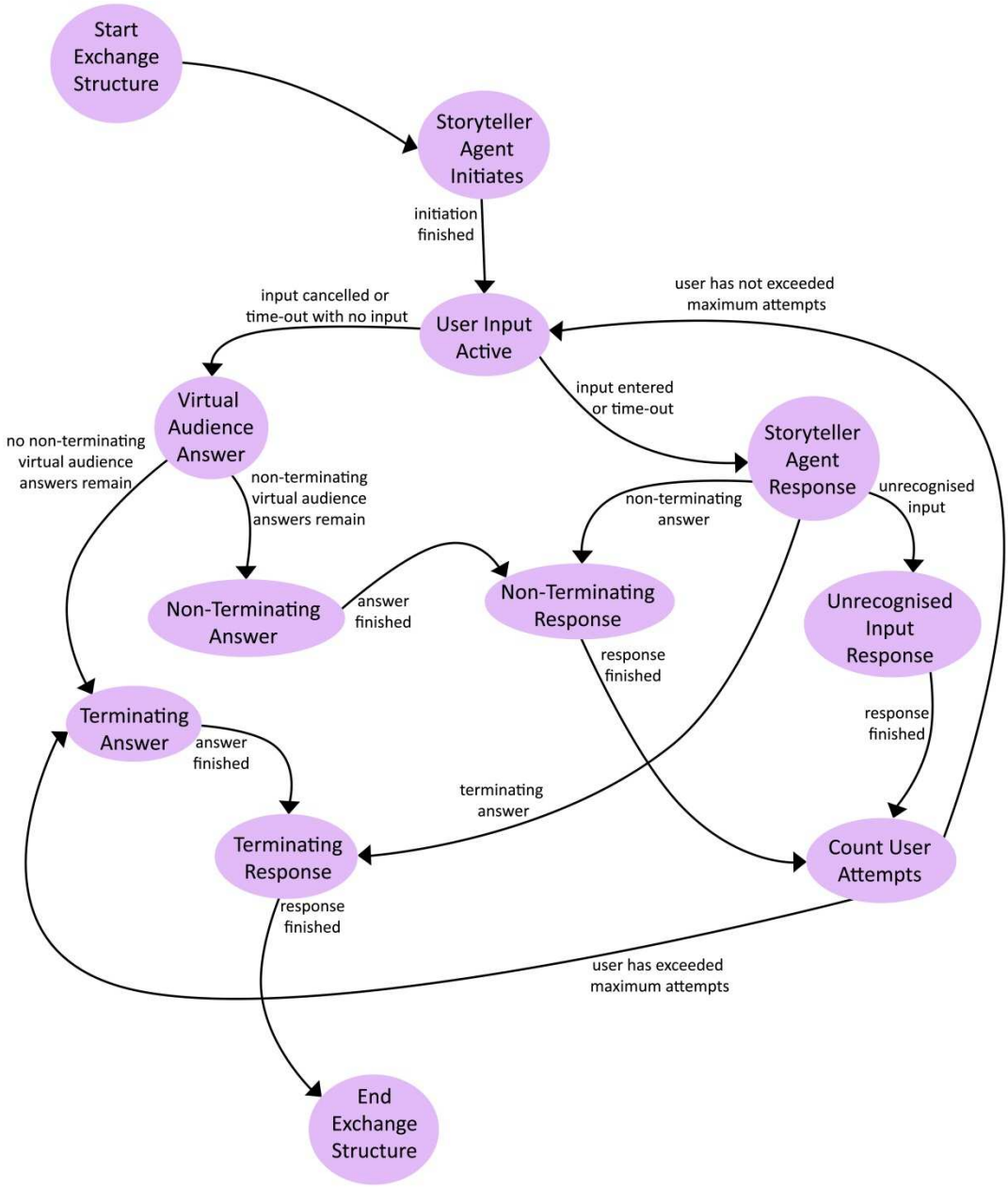


Figure 5.9 The *Exchange Structure* state machine starts with the storyteller agent posing an initiating question (*Storyteller Agent Initiates*). The user may then input an answer (*User Input Active*). If they enter input the machine moves to *Storyteller Agent Response*, from which the storyteller may give three different types of response based on the user input: (a) if it matches the terminating answer, *Terminating Response*, which, in turn leads to the end of the exchange structure; (b) if it matches a non-terminating answer, answer-specific feedback in *Non-Terminating Response*; or (c) if it matches none of the pre-defined answers, a generic "No, try again" response in *Unrecognised Input Response*. If the user cancels or inputs nothing, a virtual audience member provides an answer (*Virtual Audience Answer*). After the storyteller agent responds to non-terminating or unrecognised answers, the user's answer attempts so far are tallied in *Count User Attempts*. If they have not yet exceeded three attempts, they input another attempt in *User Input Active*. Otherwise, the virtual audience provides the *Terminating Answer* which leads to the exchange structure's conclusion.

5.4. Narratives' Order and Linkage to Objects

Our second design inspiration was to incorporate the idea of anchoring narratives in particular objects. One of the reasons we chose a VR implementation was that it enabled us to present users with the museum objects we saw incorporated in the guides' storytelling. We also wanted to explore the idea we witnessed in Linda's memory box in which a listener's selection of, or attraction to, particular objects triggered an associated narrative. We wanted to mimic this idea by populating the VE with objects which, when selected by the user, would trigger an associated narrative. Consequently users would be able to determine the order in which they experienced a collection of narratives. We were unsure whether it would be best to allow users to control the order of all five narratives or mimic the progression of Linda's storytelling where, initially, narratives were told in predefined order and, later on, listener's selection of objects determined the narratives she told. We chose to test both scenarios (we provide more detail on this in the next chapter where we describe evaluation of our design).

As described shown earlier in Figure 5.1, we wanted to include those objects the guides referenced during the five narratives we were working with:

- Photographs of Noor's grandfather and grandmother (*Family History and Home* narrative)
- Photograph of Noor's son at his name-giving ceremony (*Family History and Home* narrative)
- Photograph of Noor's District Six home (*Family History and Home* and *Group Areas and Mixed Marriages Acts* narratives)
- Two photographs of Joe's District Six home, Bloemhof Flats, before and during demolition (*From Bloemhof Flats to the Cape Flats* narrative)
- Two photographs of Richmond Street of on two-sided panel (*Richmond Street* narrative)
- Two Apartheid-era signs (*Public Signs* narrative)

We further paired the narratives with objects that could act as their triggers:

- *Family History and Home* – this narrative dealt equally with Noor's grandfather and his District Six home. Noor always referenced photographs of his grandparents at the start and the photograph of his former home at the end. We chose the photograph of his grandfather as the trigger since it was related to the beginning of the narrative. Thus, when the user selected that photograph they would immediately hear about Noor's grandfather.
- *Group Areas and Mixed Marriages Acts* – we chose the photograph of Noor's former home since he would always use it during this narrative to point out the street he lived on and explain that his friend, who was separated from his family, lived on the same street.
- *From Bloemhof Flats to the Cape Flats* – Joe always began this narrative by directing audiences' attention to the photograph of Bloemhof Flats being demolished; thus it was a the logical trigger for this narrative.
- *Public Signs* – we selected the two Apartheid-era signs, since this narrative focused on them.
- *Richmond Street* – this narrative cantered around describing the photographs on the Richmond Street panel, thus it was the only option as a trigger.

5.5. A Digital Storytelling Prototype

In this section we describe a prototype which embodied the designs described in this chapter, namely questions, exchange structures and the use of objects for triggering narratives. The prototype's primary purpose was to provide a way of testing our design. Secondarily, we wanted to give the prototype to the District Six Museum, for them to build on in the future towards their goal of preserving ex-resident's storytelling. Implementation was guided by our storyboard (Figures 5.1, 5.2 and 5.3), the narrative structure diagrams (Figures 5.5 and 5.6 provide two examples) and the state machine diagrams which defined how narratives were presented and user-storyteller interactions (Figures 5.4, 5.7, 5.8 and 5.9). Here, we briefly describe the prototype's implementation (Section 5.5.1) and user experience (Section 5.5.2). Section 5.5.3 describes the museum's input on an early version of the prototype.

5.5.1. Implementation

We wanted to build a prototype which the museum could easily run and modify in the future. Therefore, we chose a completely free implementation platform, Microsoft's XNA Game Studio, and created all models in Blender 3D, also free. We created a low-fidelity VE, capable of running on affordable desktop machines and whose content was configurable without requiring coding or recompilation. We achieved this by building the prototype as a state machine where almost all the content, including narratives, interactions, audio, layout and animations, were defined by a series of custom-format image and text files parsed on start-up to produce the VE and narratives.

The Virtual Environment:

The VE was a tile-based 3D environment, constructed at run-time according to an input image file which specified the layout using a per-pixel colour code:

- Red: wall
- Green: floor
- Teal: a virtual audience member
- White: the Joe storyteller agent
- Blue: the Noor storyteller agent
- Yellow: the user's starting position

We used the image in Figure 5.10 to build our desired floor plan of a square room with Joe and Noor models near each other, virtual audience models scattered throughout the room and the user's starting position among the audience facing the storyteller agents. However, using a different image would allow the layout to be changed without recompilation. We created low polygon models for the VE's objects and avatars. The room was textured to resemble the museum – peach coloured walls and wooden floors. The photographs and public sign objects were textured using photographs taken at the museum and, where possible, high-resolution photographs from the museum's archives. The storyteller agent models were textured using photographs of Joe and Noor and their animations were based on Joe and Noor's typical gestures and movements during storytelling (we had grown to know them well during Study One). The soundtrack was composed entirely of recordings gathered during Study One's ethnography. Originally, we had recorded Joe and Noor's tours only for the purpose of studying their storytelling. When planning the soundtrack the

storyteller agents' voices, we intended to take new recordings Joe and Noor telling their narratives according to the component structures we had derived. But, since those structures were derived from their tours, which we had recorded, they contained all the audio we needed, including recordings of Joe and Noor greeting visitors. Even though these recordings were of variable quality, using recordings from actual tours allowed us to (a) present the narratives as they were told spontaneously to real audiences and (b) combine recordings from different retellings so that the VE presented, not one particular version of a story, but a composite of different retellings and (c) use recordings of real audiences asking questions and answering exchange structures to use for the virtual audience.

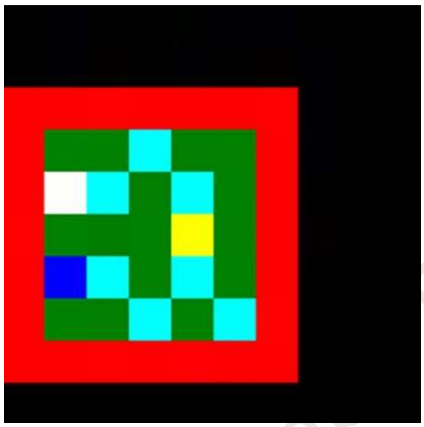


Figure 5.10 The input image defining our VE's layout. The pixel colours were interpreted as follows by the prototype at run-time: red indicates walls; green is floor (along with a corresponding ceiling tile); teal, the position of virtual audience members; yellow, the user's starting position; white, the position of the Joe model and the objects related to Joe's narratives around it; and blue, the position of the Noor model along with a bench and photographs related to Noor's narratives.

Defining Narratives, User-Storyteller Agent Interactions and Story Objects:

We made use of two types of custom-format text files to define most of the VE's content. These allowed for content changes without recompilation or coding. The first type defined the following for the storyteller agents:

- The models' rotation and scale
- The audio and animations used during their greeting at the start of the VE
- A collection of acknowledgements for questions from the user and virtual audience
- A collection of responses for unrecognised user questions

The second type defined the following for narratives, user-storyteller interactions and story objects:

- As per the design in Figure 5.4 and the example structures in Figure 5.5 and Figure 5.6, the components making up each narrative, including their types (clause, question opportunity or exchange structure)
- The audio of Joe and Noor's voices for each narrative component

- Scripting storyteller agent VE object[11] animations during narratives
- Content of user-storyteller agent interactions, namely: the keywords associated with questions and exchange structure answers; defining a question collection for each question opportunity; storyteller agents' acknowledgments of questions and responses to unrecognised questions; and defining exchange structures' initiating questions and non-terminating and terminating answers.
- Defining links between story objects and narratives

A full description of these two custom formats is too lengthy to include here, and can be found in Appendix C.

5.5.2. The User Experience

Figure 5.11 shows the VE upon start-up: the user is part of a virtual audience facing the two storyteller agents and is able to move and look around using standard keyboard and mouse controls. The agents introduce themselves before the narratives begin.

Figure 5.11 The VE as it is first seen by the user, including the storytelling agents modelled after Noor (left) and Joe (right). Also visible, are other audience members and museum objects: around the Noor agent are pictures of Noor's grandparents (above the Noor agent), his infant son (to the left of the Noor agent) and his former home in District Six (to the right of the Noor agent). Near the Joe agent are pictures of Bloemhof Flats before demolition (to the left of the Joe agent) and during demolition (above the Joe agent), a Richmond Street panel and two Apartheid-era public signs (both to the right of the Joe agent).

To mimic hand-raising for asking questions, users could, at any point during a narrative, press the Space bar to signal their desire to ask a question. To remind users of this, the text, shown in Figure 5.12, "You may press SPACE to put up your hand" was displayed as long as the question repertoire of the storyteller agent current speaking had not been exhausted. If the user pressed the Space bar,

[11] Only the Richmond Street panel was animated.

the text reminder is removed and a hand icon, also shown in Figure 5.12, is displayed, to indicate that the user's hand is up, until the storyteller agent acknowledges the user's question. Users were able to enter input for questions and exchange structures by typing into the box, shown in Figure 5.13, at the bottom of the screen. It allowed users to type and press the Enter key to enter their input. Users could also decide not to enter input and press Escape key to cancel the typing box leading to an appropriate action by the storyteller agent or virtual audience. As per our design for questions and exchange structures, users had a limited, but reasonable, timeframe for entering input. When exceeded, the typing box was removed and the storyteller agent would parse any input typed so far.

Figure 5.12 While the Noor agent is telling a story the user is reminded that they may 'put up their hand' by pressing the space key (top). When the space key is pressed, a hand icon (bottom) appears and is displayed until the agent acknowledges the user's question.

Figure 5.13 The typing box in which users enter question and exchange structure inputs.

In order to have certain objects trigger narratives, we implemented what we refer to as *story objects*, which users could click on to experience a narrative related to the object. Not all of the VE's objects were associated with narratives in this way (Section 5.4 specifies the object-narrative pairings). Thus, when selection was possible available story objects pulsated gently and users were

provided with a blue crosshair (shown in Figure 5.14 below) attached to their mouse position for clicking on an object. Furthermore, when a story object's narrative had been told, the object would no longer pulsate – allowing users to know which story objects' narratives they had and had not heard.

Figure 5.14 Screenshot showing the mouse-controlled crosshair which users could use to select pulsating story objects. Selecting a story object triggered its associated narrative. Additionally this screenshot shows the Richmond Street panel (to the right of the Joe agent), before the *Richmond Street* narrative has started.

One further detail, related to the objects in the VE, was added the Joe's *Richmond Street* narrative. Joe almost always told this narrative with the Richmond Street panel first showing Richmond Street in 1960. Then, during the narrative's complicating action clause, he would rotate the panel to reveal the now-demolished Richmond Street. We wanted to maintain this visual comparison, including its timing, in the prototype. Therefore, we created a model of the Richmond Street panel, pictured in its starting position in Figure 5.11. During the Richmond Street narrative's complicating action, the panel moved out from the wall and rotated to reveal the photograph on the other side, as in Figure 5.15. Finally, once all five narratives were complete, the lights in the VE faded down, gradually, to black and the prototype exited automatically. In the next chapter we describe how we tested efficacy of the two strands of designs the prototype embodied – the user-storyteller agent interactions and use of story objects.

Figure 5.15 A screenshot from the Richmond Street narrative showing the Richmond Street panel after it has rotated to reveal the present-day, razed street.

5.5.3. Demonstrating the First Version to the Museum

Once a first version of the prototype was complete, we demonstrated it to almost all the museum staff as group and encouraged their discussion and feedback. We did this as a means of ensuring that our design resonated with the museum and ex-residents' storytelling and to gather suggestions for improving the design. The demonstration took the form of a presentation to fifteen staff members including front desk and technical staff, archivists, curators and ex-residents Joe and Linda (Noor was unable to attend). We described the overall purposes of our project, for those unfamiliar with it, and demonstrated the prototype, projected on a large screen with the main researcher executing a sample user experience. We demonstrated questions by typing in questions the agents would and would not recognise. Similarly, for exchange structures, we showed the input of terminating, non-terminating and unrecognised answer attempts. We also demonstrated story object selection. After the demonstration, we elicited the staff's impressions, suggestions and questions. The user-storyteller agent interactions drew numerous positive comments; one archivist felt it improved upon static video recordings of Joe and Noor. A curator felt that, that despite the simple graphics, the prototype captured Joe and Noor's personalities by using their natural voices and animations which imitated their movements. Another archivist felt that the VE was sparse and suggested adding more content to the walls. While we agreed, we decided to keep the VE objects as they were since we wanted to keep the prototype simple and felt that adding more objects had the potential to distract from the storyteller agents. Overall, two themes the dominated the discussions: sufficient contextualisation and providing guidance for inputting questions.

Sufficient Contextualisation:

The curators pointed out that, since the five narratives were extracted from tours, some of the context the museum visitors would typically receive was missing. In particular, the VE might be interpreted as being about Joe and Noor; as opposed to the overall impact of District Six's forced removals. So, when presented outside the contextualising setting of the museum, the prototype's content may appear to "come out of the blue". We agreed that installing the prototype as an exhibit at the museum itself, or making it available from the museum's website would constitute properly contextualized usage scenarios. The overall suggestion was the user's experience should begin with awareness that the VE presents the perspectives of two District Six ex-residents, out of the sixty thousand affected by forced removals. Numerous staff members, including Joe, suggested ways for delivering this context, for instance via an introductory voice-over, video or text, adding a "Forced Removals" sign in the VE, adding more content to the storyteller agents' introductions. For our own studies evaluating the prototype, we employed the simple solution of having participants read a contextualising text before they experienced the VE (we describe this further in Chapter 6).

Guidance for Inputting Questions:

Discussion regarding questions led us to make one change to our design. One staff member pointed out that, during the demonstration, the main researcher could demonstrate questions successfully since we *knew* which questions the storyteller agents could answer. However, users might enter questions the storyteller agents did not recognise or might be uncertain about what to enter as questions. There were numerous suggestions for allowing users to enter questions the storyteller agents would recognise, including adding a dropdown list of possible questions from which users could select or giving hints for questions. We explained that we wanted to give users the impression that they could input any question they wanted, despite the storyteller agents' limited question

repertoires, and that the keyword matching method used was, hence, lenient (requiring only one word of the user's input to match a question keyword to be judged as a match). In response to this, staff members suggested giving users the option to enter their own question or choose from a list of questions or allowing users to choose whether they wanted the prototype provide full questions, keyword hints or no help with questions.

Reflecting on this feedback, we agreed that users might require assistance entering questions the storyteller agents would recognise. But, we did not want to make the storyteller agents' limited question repertoires transparent. In considering a solution, we reflected back on Joe and Noor's tours. Often when Noor invited questions from the audience, but was met with hesitation, he would re-prompt for questions and give hints for questions to which he had well-rehearsed answers (see Section 4.2 in Chapter 4). So, we adjusted the question design to imitate this behaviour by displaying hints, in the form of keywords, for questions in the storyteller agent's repertoire. Like Noor, hints, these were only supplied given if the user seemed hesitant raise a hand during question opportunities or took a long time to type question input. Our original question design already included a time-out if users took a long time to input a question, now there were two time limits. If the user exceeded the first, question hints were displayed. If the second was exceeded the interaction ends, in the case of user questions, or, in the case of question opportunities, a virtual audience member asks a question. We felt this solution struck a balance between giving the user the impression of being free to input any question while providing guidance if they appeared to need it.

5.6. Summary

This chapter described how Study One's findings led to our two foci for digital storytelling design: simulating user-storyteller interactions in the form of questions and exchange structures and the use of story objects to trigger narratives. We chose to embody our design idea in a prototype which took the form of a VE containing two storyteller agents, modelled after Joe and Noor, and objects they used during their narratives. We further chose to work with their five most-told personal experience narratives. In Study One we found that all guide-audience interactions occurred between, and never during, a narrative's clauses. Furthermore, the most prevalent interactions took the form of audiences asking guides questions and guides asking audiences questions. Both these matched the teacher-student interactions studied by Sinclair & Coulthard (1975). Hence, we conceptualised digital narratives as sequences of three types of components: static clauses; question opportunities where storyteller agents allow multiple questions from the user and/or virtual audience; and exchange structures where storyteller agents poses a question to the user and virtual audience. Furthermore, user could put up their hand (by pressing a key) to signal their desire to ask a question, at any point during a narration. When the storyteller agent finished their current component, the user would be allowed to input a question before the narrative's next component began. The component structure, hence, ensured that interactions never took place during a clause. We also associated narratives and objects with each other by designing story objects which, when selected by the user, trigger the storyteller agent telling a narrative related to that object. In the next chapter, we delve into our evaluation of the design ideas discussed in this chapter, namely questions and exchange structures, and story objects, which were embodied by our storytelling prototype.

Chapter 6

Studies Two & Three: Evaluating our Digital Storytelling Design

In the previous three chapters, we described our ethnographic study (Study One) of District Six ex-residents, Joe Schaffers and Noor Ebrahim, telling personal experience narratives and how, from it, we drew novel designs for digital storytelling. The design had two main foci: incorporating effective user-storyteller agent interactions into narratives; and associating narratives with related objects. We created a prototype to embody these ideas; it took the form of a simple desktop virtual environment (VE) where the user finds themselves part of a group listening to two storyteller agents, based on Joe and Noor. The agents tell five narratives in total and occasionally interact with the user by allowing the user to ask *questions* and by initiating *exchange structures* where they ask questions of the user and a virtual audience. Furthermore, at certain points, the user is able to trigger narratives by clicking on *story objects.* The remainder of this dissertation describes our critical evaluation of this prototype, focusing testing the effectiveness of questions, exchange structure and story objects. In Section 1.6.1 we describe our evaluation approach wherein we tested the prototype in a series of three studies. Thereafter we focus on Study Two and Study Three – both experiments designed to test the effectiveness of the user-storyteller agent interactions and story objects, respectively. Section 1.6.2 details their design, Section 1.6.3 the measures used, Section 1.6.4 the prototype pilot trial that preceded the studies, Section 1.6.5 the sample and Section 1.6.6 the experiment procedures used.

6.1. Evaluation Approach

Here we describe the research questions we sought to answer in our design evaluation (Section 6.1.1), our approach to measuring storytelling effectiveness (Section 6.1.2), and our hypotheses (Section 6.1.3).

6.1.1. Research Questions

We sought to answer three questions related to different aspects of our design; these formed this project's third, fourth and fifth research questions:

3. *Are audience-storyteller interactions from real-life personal storytelling effective in digital storytelling? We consider two forms of interactivity:*
    i. ***Questions**: The user is able to input questions to a storyteller agent by raising their hand during a narrative and during question opportunities, where the storyteller agent accepts multiple, consecutive questions.*
    ii. ***Exchange Structures**: the storyteller agent poses a question and prompts the user to input attempts at answering it until the correct answer(s) are reached.*

4. *Is the use of **story objects** as a mechanism for allowing the user to trigger narratives more effective than presenting narratives in a predetermined order?*

5. *Is an interactive digital storytelling system effective for engaging **museum visitors**?*

Question (3) was concerned with effectiveness of translating the interactions we had observed in real-life storytelling, during Study One, to digital storytelling. We explored two interactions in particular: *questions* in which users could ask storyteller agents questions and *exchange structures* where storyteller agents asked the user questions and iteratively steered them towards the correct answer(s). In particular we wanted to see if introducing these interactions to digital storyteller would offer an improvement over experiencing personal experience narratives without interaction. Question (4) addressed *story objects*, which were objects that users could select in order to hear an associated narrative. Given that users are being presented with a number of narratives, we wanted to test whether allowing them to select, or trigger, narratives via story objects offered an improvement over presenting narratives in a predetermined order. Finally, with question (5), we wanted to test the effectiveness of our prototype in a public setting – specifically the District Six Museum. This was an important consideration since this, for our collaborators, this project was an exploration of ways to preserve the storytelling of District Six ex-residents for when they are no longer able to tell them in-person. This chapter, along with Chapter 7, focuses on the studies designed to answer questions (3) and (4), namely Studies Two and Three, respectively. Chapter 8 describes Study Four, which was aimed at answering question (5), while Chapter 9 discusses the results of all three studies.

6.1.2. Judging the Success of Digital Storytelling: Measuring Story Experience

The first step in answering research questions (3) and (4) above was finding a useful way to judge our design's efficacy. Hence, we wanted a way to measure the quality of users' experience of Joe and Noor's narratives. To this end, we drew from our own previous work in which we developed a questionnaire to measure the effectiveness of a virtual environment (VE) for presenting San[12] folktales (Ladeira & Blake, 2004; Ladeira, 2005). There, we used literature from storytelling and education research to identify characteristics of an *effective story experience* – particularly in the domain of cultural heritage narratives. We created a questionnaire consisting of different scales, each one measuring a different aspect of story experience. Each scale was tested for psychometric soundness (validity and reliability) and refined over the course of two large studies with a cumulative sample of 186 (Ladeira, 2005). Here, we reused and adapted those scales which were most successful and applicable to our current work, namely:

- ***Interest*** in finding out more about a narratives' broader context; measured using a valid and reliable eight-item scale.

[12] The San are an indigenous people of southern Africa, which includes South Africa, Zimbabwe, Lesotho, Mozambique, Swaziland, Botswana, Namibia and Angola. They are well-known for their rock art in this regions, hunter-gatherer lifestyle and rich tradition of oral storytelling and folktales (Parkington, 2003).

- ***Enjoyment*** of a narrative is an important goal in storytelling (Hayes-Roth, 1999; Madej, 2003; Schell, 2005); measured using a two-item scale which was valid, but could not be tested for reliability since at least three items are required to calculate reliability (Cronbach, 1990).

- ***Attention*** paid to a narrative; measured using one-item scale, which could not be tested for reliability or validity since at least two items are required to test for validity via inter-item correlations (Howell, 1987).

- ***Boredom*** during a narrative; measured using one-item scale which could not be tested for validity or reliability.

- ***Confusion*** regarding the narrative content; measured using a two-item scale which proved valid, but could not be tested for reliability.

- ***Existing Knowledge:*** In order to control for previous knowledge of the narrative's context and content[13], we created a two-item scale which was valid, but could not be tested for reliability. This factor did not prove to significantly influence any of the above story experience factors.

- ***Interest Tendency:*** Similarly, to control for individual predispositions toward showing an interest in a narrative[14], we created a two-item scale which was valid, but could not be tested for reliability. This factor was significant, positive predictor of *Interest*.

The above list also shows that many of the scales in our previous work could not be proven fully sound due to consisting of too few items to calculate validity and/or reliability. So, in our current work, we decided to improve them by increasing the number of items. We also added one new factor: *Storytelling Realism*. Since one of the main tenants of our research approach was to design digital storytelling that imitated real-life storytelling, it made sense to add a measure for how "real" the storytelling seemed to users. Later, in Section 6.3, we give specifics of the questionnaire created for Studies Two and Three.

6.1.3. Hypotheses

Overall, we expected allowing users to participate in a digital narrative would be more engaging, and would provide a better story experience, than passively listening to a narrative, as one would watching a video recorded storyteller, for instance. We also expected that digital narratives with some dynamism, as a result of user-storyteller interactions, would lead to a better story experience than static narratives which are the same each time they are experienced. Even though Joe and Noor's narratives were not very dynamic across retellings, they did vary as a result of interacting with their audiences. The

[13] In our previous work, "context" included the San and their storytelling tradition, while "content" included knowledge of specific San folktales.

[14] Hence, in our previous work, the *Interest Tendency* scale measured the tendency to show interest in indigenous narratives and folklore in general.

interactions we focused on, namely questions, exchange structures and story objects, were intended to allow users to part participate in the storytelling and impact the course of the storytelling somewhat.

Questions and Exchange Structures:
Regarding research question (3) above, we hypothesised that questions and exchange structures would leave users with greater interest in discovering more about the narratives' contexts – that allowing users to enter questions would get them thinking about aspects of narratives they would like to know more about later. We predicted that the action of probing the storyteller agents for more information would predispose them to the idea of seeking out more information beyond their digital storytelling experience. Similarly, we hypothesised that experience of participating in dialogue, during the exchange structures, would encourage users to seek out more dialogue about narratives. Where users were unable to answer the storyteller agents' questions, exchange structures might serve to highlight topics that users do not know about, leaving them with an interest in pursuing more information. We also expected that interacting with the storyteller agents would lead to more enjoyable experiences which held user's attention and eliminated boredom. In turn, paying greater attention to the narratives should facilitate a coherent experience of the narratives, resulting in less confusion. Since we designed questions and exchange structures after observing real-life oral storytelling, we expected that they would evoke a greater sense of listening to real storytellers. We hoped that our implementation of questions and exchange structures would be familiar and intuitive by virtue of resembling interactions which users would likely encounter in real-life storytelling. Lastly, we expected that questions and exchange structures might interact since they both shared the key similarities of (a) being question-answer interactions and (b) involving interaction with a storyteller agent.

Story Objects:
For research question (4), we hypothesised that the interaction provided by story objects would serve to reduce users' passivity resulting in a more engaged experience. We further expected that allowing users to control the order in which the experienced a collection of narratives would give them a sense of agency over their experience. Section 5.4 in Chapter 5 described that we wanted to test different extents of using story objects. We did this by comparing three versions of the prototype: one with no story objects; one that combined narratives told in a predetermined order and one's triggered through story objects; and one where all the narratives were triggered through story objects. We expected that the use of story objects in the latter two scenarios would result in a more effective story experience than the first scenario. More specifically, we expected that the combination of pre-set narratives and narratives triggered via story objects (which mimicked the way Linda presented narratives in her memory box) would produce the most effective story experience.

Furthermore, we hypothesised that, by choosing objects which interested them, users might identify topics they would be interested in finding out more about after their digital storytelling experience. We also expected that allowing users to browse the objects carefully and giving them control over narratives' order would lead to more enjoyable experience. We hoped that while choosing story objects, users would be thinking about which object seemed interesting to them such that their chosen narratives, would hold their attention better and minimise boredom. We also expected that having

selected an object would increase the likelihood that they would use the story objects as visual references while listening to the storyteller agents, keeping their attention on the narrative, resulting in a coherent story experience. Finally, we hypothesised that the use of story objects would be reminiscent of the real-life actions of engaging with a collection of museum artefacts and their associated narratives. Therefore, we expected that the use of story objects would increase storytelling realism.

6.2. Study Designs

Studies Two and Three were designed answer research questions (3) and (4), described in the previous section, respectively. In this section will describe the design and independent variables of each study in Sections 6.2.1 and 6.2.2. While they addressed different questions, both studies shared the same dependent and control variables; these are described in Section 6.2.3.

6.2.1. Study Two

Study Two tested the effect of questions and exchange structures, on story experience by comparing the story experience of users who experienced the user-storyteller interactions with those who did not. Hence, there were two independent variables, each with two levels:

- ***Questions (Que)*:**
    - In the *Questions* (*Q)* condition users were able to input questions
    - In *No Questions* (*NQ)* users could not input questions.
- ***Exchange Structures (ES)*:**
    - In *the Exchange Structures* (*E)* condition, the storyteller agents initiated exchange structure interactions with the user
    - In *No Exchange Structures* (*NE)* there were no interactive exchange structures.

These allowed us to test for the effect of *Que* by comparing story experience in the *Q* and *NQ* conditions. Similarly, comparing the *E* and *NE* conditions would allow us to the test for the effect of *ES*. We also wanted to test for interaction effects of *Que* and *ES*. Hence, we used the factorial 2x2 design shown in Table 6.1. This design required four versions of our storytelling prototype:

1. *Q+E*: The VE with both questions and exchange structures.
2. *Q+NE:* The VE with questions and no exchange structures.
3. *NQ+E*: The VE with exchange structures and no questions.
4. *NQ+NE*: The VE with neither questions nor exchange structures.

	Exchange Structures (E)	***No Exchange Structures (NE)***
Questions (Q)	*Q+E*	*Q+NE*
No Questions (NQ)	*NQ+E*	*NQ+NE*

Table 6.1 Study Two's factorial 2x2 design for studying the effect of Questions (Que) and Exchange Structures (ES) on story experience. This design entailed the comparison of four different versions of the storytelling prototype: one containing both questions and exchange structures (*Q+E*); one with questions and no exchange structures; one without questions and with exchange structures; and one with neither questions nor exchange structures.

Furthermore, we used a between-subjects design, so each participant would experience only one of these four versions. Having participants experience more than one version of the prototype would have entailed experiencing the narrative content repeatedly which would likely have (a) impacted story experience and (b) fatigued participants (the full prototype lasted between 20 and 30 minutes). We further wanted to ensure that, despite the interaction differences in the four conditions, the same narrative content was experienced by all participants. In particular, we were concerned that participants in the NQ and NE conditions would not experience the additional content conveyed during the questions and exchange structures. For example, in the *Group Areas and Mixed Marriages Acts* narrative, there is a question opportunity where Noor's question answers explain what happened to the couple in the story. The conclusion of in Noor's *Family History and Home* narrative was delivered during an exchange structure. In the Q conditions, the user hears the additional content of the storyteller agents' answers to questions (either to questions input by the user or asked by one of the virtual audience members). Therefore, we included the content of the nine questions we created as non-interactive content in the NQ condition VEs. Participants in NQ conditions, therefore, heard these questions exchanged between the storyteller agents and the virtual audience members. Similarly, in the E conditions, users heard the exchange structures take place between the storyteller agents and virtual audience. Lastly, we ensured that the use of story objects was the same in all four conditions. We chose to have all four versions of the prototype deliver the first two narratives, Noor's *Group Areas and Mixed Marriages Acts* and Joe's *From Bloemhof Flats to Cape Flats,* in a predetermined order. The next three narratives, Noor's *Family History and Home* and Joe's *Public Signs* and *Richmond Street*, could be accessed via story objects.

6.2.2. Study Three

Study Three tested the effect, on story experience, of using story objects to trigger narratives vs. presenting narratives in a predetermined order. We chose to compare having all five narratives in a predetermined order (i.e. no story objects), combining predetermined and story object narratives and having all five narratives triggered via story objects. Therefore, there was one independent variable with three levels:

- ***Story Objects (SO):***
    - *Predetermined Narratives* (*P):* no story objects; all five narratives presented the same order (*Group Areas and Mixed Marriages Acts, From Bloemhof Flats to Cape Flats, Family History and Home Public Signs* and *Richmond Street*)
    - *Predetermined Narratives and Story Objects* (*PO):* the first two narratives followed a predetermined order (*Group Areas and Mixed Marriages Acts* then *From Bloemhof Flats to Cape Flats*) and, thereafter, users trigger the three remaining narratives by selecting one of three available story objects.
    - *Story Objects* (*O):* all five narratives could be triggered by selecting story objects.

Thus, Study Three took the form of a one-way 3x1 comparison shown in Table 6.2, which required three versions of the prototype, one for each condition described above. All three conditions included questions and exchange structures. As with Study Two, we used a between-subjects design.

Story Objects (SO):	Predetermined story order	Predetermined story order combined with story objects	Story objects only
	P	*PO*	*O*

Table 6.2 Study Three's one-way 3x1 design for studying the effect of Story Objects (*SO*) on story experience. This design entailed the comparison of three different version of the storytelling prototype: in *P* all five narratives were presented in a predetermined order; in *PO* the first two narratives occurred in a predetermined order while the remaining three could be triggered by selecting one of three available story objects; and in *O* all five narratives be accessed via story objects.

6.2.3. Dependent and Control Variables

Since Studies Two and Three were both concerned with the effect of the prototype on story experience, they had the same dependent variables, representing different aspects of story experience:

- ***Interest (Int)*** in finding out more about narratives' broader context subsequent to experiencing the prototype. In our studies, this meant an interest in District Six and the history of Apartheid and forced removals.

- ***Enjoyment (Enj)*** of the narratives and storytelling.

- Level of ***Attention (Att)*** paid to the storytelling.

- ***Boredom (Bor)*** experienced during the narratives.

- ***Confusion (Con)*** regarding the narrative content.

- ***Storytelling Realism (SR)*****:** A rating of much the prototype's storytelling felt like real-life storytelling.

We also collected some data related to participant characteristics which might influence their story experience scores. These formed control variables in our analyses related to story experience:

- ***Existing Knowledge (EK)*****:** how much participants felt they knew about South Africa's Apartheid history, specifically related to forced removals and District Six, *before* experiencing the storytelling prototype.

- ***Interest Tendency (IT)*****:** participants' tendency to show interest in South African history and personal experience narratives.

- Demographic data: age, gender, year of study, faculty, nationality, race, hometown and whether participants had visited the District Six Museum or had learnt about District Six at school (a common subject in Cape Town area schools)

6.3. Measures

In Study Two, we logged all user activity during question and exchange structure interactions so we could see how participants actually interacted with the storyteller agents. For both studies, we created a self-report questionnaire to capture demographic data, the control variables, story experience scores and qualitative, open-ended feedback regarding the prototype.

6.3.1. User Activity Logs

As well as testing for the effect of questions and exchange structures on story experience we wanted a complete picture of how users partook in these interactions. We were interested in seeing whether they exploited opportunities to ask the storyteller agents questions and attempted to participate in exchange structures. We also wanted to assess how successfully our prototype was able to answer users' questions and handle their exchange structure inputs. So, the storytelling prototype automatically logged the number of:

- times the user put up their hand, in the VE, to ask a question (both during narratives and question opportunities)
- and content of question entered
- times question input was cancelled
- user questions which could not be answered
- timeouts during question opportunities
- attempts at answering exchange structures
- times exchange structure input was cancelled
- unrecognised exchange structure inputs
- times the user exceeded the maximum allowed exchange structure answer attempts
- exchange structures successfully terminated by the user

User activity such as such as inputting questions and attempting to input exchange structure answers, would reflect whether participants actually engaged with the storyteller agents. Meanwhile, choosing to opt out of entering input and allowing question opportunities to timeout, would likely indicate disinterest in partaking. Finally, we were also interested to see if there was any relationship between the above user activity and story experience as measured by our questionnaire.

6.3.2. Questionnaire

Our questionnaire gathered demographic, control, story experience and qualitative data in the following order: demographic information; qualitative feedback; a series of Likert-type items to measure the existing knowledge, interest tendency and story experience; a section where participants indicated whether they had visited the District Six Museum or studied District Six at school; a section allowing for open-ended comments regarding their experience of the prototype. The full questionnaire can be found in Appendix D, Section D.3.

Demographic and Control Data:
The questionnaire began by asking participants to indicate: age; year of study and faculty (the samples in Studies Two and Three consisted of university students); nationality; race (since the narratives dealt with Apartheid and racial discrimination, we felt that the way in which participants identified themselves might influence how they responded to them); hometown; and gender.

From our previous work, we adapted scales used to measure existing knowledge of District Six and forced removals and their tendency to be interested in South African history and in personal experience narratives. These items took the form of statements to which participants rated their agreement or disagreement on a seven-point Likert scale. Selecting a 1 indicated complete disagreement with the statement and 7 indicated complete agreement. The scores of items marked "reverse" were inverted. For example, for the "I had not heard / read any District Six stories before today" item below, a high score indicated a low level of existing knowledge and vice versa. The following items were used to measure *Existing Knowledge*:

- I had never heard of District Six before today.
- Before today, I knew quite a bit about the forced removals that took place during Apartheid.
- I had not heard / read any District Six stories before today. (reverse)

And, the following for *Interest Tendency*:

- I enjoy hearing/reading personal stories about historical events.
- I enjoy hearing/reading about South Africa's history.
- I enjoy learning about South Africa's history.

Story Experience:
In Section 6.1.2 we explained we drew from previous work on understanding and measuring the subjective experience of narratives by defining different aspects of *story experience* and creating a questionnaire scale to measure each aspect. In our current work we reused and adapted those scales that had, previously, proven most successful, namely: *interest, enjoyment, attention, boredom* and *confusion*. We adapted the items in these scales for use in the context of District Six narratives (instead of the San and indigenous folklore). Additionally, we aimed to improve some of the scales. Previously the enjoyment, attention, boredom and confusion scales consisted of one or two items, but to test for psychometric validity (using inter-item correlations), at least two items are required and to test for reliability (using Cronbach's alpha coefficient), at least three items are needed (Howell, 1987; Cronbach, 1990). So, for these scales, we added additional items. We also created a new scale to measure *storytelling realism*. All the story experience items took the form of a statement which participants were asked to rate on seven-point Likert scale. Items marked as "original" below were adapted from our previous work's questionnaire, while "new" indicates items added for the current work and "reverse" indicates reverse items:

- Interest items:
  1. I would like to hear/read more forced removal and District Six stories like the ones today. (original)
  2. Reading a book about the forced removals would be very little fun for me. (original; reverse)
  3. I would not be interested in going to an exhibit or museum about District Six. (original; reverse)
  4. I would like to find out more about District Six. (original)
  5. I would enjoy watching a film about District Six. (original)
  6. At a library, I would look for books with more information about District Six and forced removals. (original)
  7. I think South African history is very interesting. (original)
  8. I would not enjoy watching a video based on District Six. (original; reverse)
  9. I would like to find out more about Apartheid and/or forced removals. (new – in item 5 above we inquired into interest in District Six; we added this item to capture an interest in the broader narrative context)

- Enjoyment items:
  1. I enjoyed my experience of the stories. (original)
  2. I did not enjoy the stories. (original; reverse)
  3. I would characterise my experience of the stories as fun. (new)

- Attention items:
  1. The stories held my attention. (original)
  2. I did not pay much attention to the storytellers. (new; reverse)
  3. I spent most of the time looking at the storytellers. (new)

- Boredom items:
  1. I found the stories boring. (original)
  2. During the storytelling I experienced boredom. (new)
  3. I would characterise my experience of the stories as captivating. (new; reverse)

- Confusion items:
  1. I found the stories confusing. (original)
  2. I did not understand the stories. (original)
  3. The stories were hard to follow. (new)

- Storytelling Realism items:
  1. I felt like I was listening to real-life storytelling. (new)
  2. The storytellers seemed like real people. (new)
  3. The storytelling did not seem realistic to me. (new; reverse)

Qualitative feedback:
Finally, we gathered participant's impressions of the prototype by asking them to identify what they liked and disliked about it and invited open-ended comments. We also them if they preferred certain narratives over others; we did this since the five narratives featured different amounts of interactivity, for instance, the Noor agent's narratives contained most of the exchange structures. Therefore, we wanted to know if participants specifically preferred the more or less interactive narratives. We hoped this qualitative feedback would build a fuller picture of participant's experience of the prototype. The qualitative items took the form of questions and statements:

- Which story did you enjoy the most and why?
- Which storyteller did you enjoy the most and why?
- List any things about the storytelling environment that you liked.
- List any things about the storytelling environment that you did not like.
- General comments.

6.4. Pilot Trial

Before conducting Studies Two and Three, we ran an informal pilot trial with 5 volunteers, all of whom were postgraduate Computer Science students familiar with navigating desktop VEs. We did this primarily to iron out any issues we had not identified with the prototype in our own testing. The volunteers experienced all five narratives and tested all the possible interactions (questions, exchange structures and story objects). When they were finished or, as happened in two cases, the prototype crashed unexpectedly, we asked for general, open-ended feedback.

The pilot revealed a serious technical issue that only arose while users typed input. Another volunteer noted that, under certain conditions, one of the story objects did not pulse as it should have. Three volunteers told us that their questions were not always answered successfully and almost all reported being able to use the exchange structures quite easily. Three volunteers noted that the quality of the audio varied during the story narrations since the prototype stitched together recordings from a variety of Joe and Noor's tours. While this audio captured their natural real-life storytelling, it also meant that the VE's soundtrack was composed of audio files with slightly different quality, volume levels and ambient noise. Two volunteers noted that the transitions between the storyteller agents' greetings and their narratives seemed abrupt and sometimes they didn't notice when a new storyteller agent was speaking. One volunteer remarked that they could not always get all their input typed for questions or exchange structures before the typing dialog timed out. Another suggested the mouse movement was too sensitive. Since we were time constrained, we prioritised fixing those bugs which caused the prototype to crash or not function properly. Beyond these we made changes that could completed and tested in a fairly short time, namely increasing the break between the two introduction pieces and pre-set stories, increasing the time given for typing input, and decreasing the mouse sensitivity. Unfortunately, we did not have the time to fix the soundtrack's volume variations as this required manual editing of 179 audio files.

6.5. Sample

A combined sample of 150 was drawn for both studies. The study was advertised, at the University of Cape Town, as a District Six storytelling study, via flyers and announcements at a selection of lectures. Participants signed up voluntarily and were paid 50ZAR for 45-60 minutes of their time. The data of 5 participants was excluded due to an unexpected prototype crash on the first day of experiments (the issue was resolved for the remainder of the studies). Study Two's design required participants to fill four conditions: *Q+E; Q+NE; NQ+E* and *NQ+NE*. Ultimately, there were 25 participants each in *Q+E, Q+NE* and *NQ+NE*, and 26 in *NQ+E*. In Study Three, 22 participants each were assigned to the *P* and *O* conditions and 25 to *PO*. The two studies had one overlapping condition; earlier we described that all of Study Two's conditions featured a combination of pre-set and story object narratives while all of Study Three's conditions featured questions and structures. Therefore, Study Two's *Q+E* condition was equivalent to Study Three's *PO* condition and was used in both studies' analyses.

6.6. Experiment Procedure

Studies Two and Three were conducted consecutively with the same experimental procedure. We set up a quiet room with four computers with similar hardware specifications and graphics processing power and identical 17-inch LCD displays. This setup accommodated up to four participants simultaneously during hour-long sessions. We set up physical barriers between computers so that it was not possible to see other participants or their displays. We also set up a waiting area, away from the experiment room, for participants arriving for forthcoming sessions so that they did not disturb in-session groups.

Each session covered only one experimental condition, which was determined before participants arrived, ensuring random assignment to conditions. Furthermore, we created the impression that the sessions did not differ from each other in any way by only training participants in the interactions that were part of the current session's experimental condition. For example, participants in Study Two's *Q+NE* condition were told about, and trained to use, the VE's navigation controls, questions and story objects, but were told nothing about exchange structures. Awareness of different experimental conditions might have resulted in an experimenter bias effect[15] (Rosenthal, 1964; Kintz, et al., 1965). Furthermore, since we had advertised our studies around the university campus, we were aware that students who knew each other might sign up. Hence, we wanted to prevent a scenario in which Participant A, having been through our experiment, told future Participant B about their experience leading Participant B to expect their experience to be the same. This would be particularly problematic is Participants A and B fell into different experimental conditions. Therefore, once participants were in the experiment room, we asked whether they knew anyone who had already participated in the study and, if so, whether they had heard anything about the study. If anyone proved to know anything beyond the fact that the study was related to District Six narratives, they would have to leave the study. Fortunately, we did not have to exclude anyone from the studies. We then requested that all current participants not

[15] If participants are aware that there are different conditions in an experiment, they may infer that some conditions are inferior to others. And, in an effort to please the experimenter or give the "right" responses, they may try to identify whether their condition is the "better" one or not. This can bias a sample's response to favour one of the experimental conditions.

tell any future participants anything about the studies. We explained that any future participants who knew anything about the studies would be excluded and would, consequently, not receive payment. Our caution was effective since new participants who had spoken previous participants, told us that previous participants refused to tell them anything about the study. Next we describe the order of events in each session from participants' arrival to debriefing, at the end.

Consent Form and Introduction:

Before each session we placed a consent form (shown in Appendix D, Section D.1) on the four chairs in the waiting area for participants to find upon arrival. It explained that stories about District Six and Apartheid-era forced removals would be presented in a VE on a computer. It further explained that the study had been approved by the university's research ethics board and student affairs department, participants were free to terminate their involvement at any point and they could request information about the research's outcomes in the future. If, after reading the consent form, participants were happy to continue, they signed it, handed it back to the experimenter and were ushered into the experiment room.

Training:

Next we explained that the storytelling VE participants would be experiencing would allow for a number of interactions. To prepare them, we explained all the controls required for the storytelling VE. Each time we explained a set of controls or interaction, we allowed participants time to practice it in a training VE until they felt comfortable with it. The training VE consisted of two adjoined rooms, similar to those in the storytelling VE. All the interactions were text based, so the VE communicated with the user via text printed on the screen and there were no avatars or audio. This allowed participants to practice while hearing the experimenter's instructions. The exchange structures and questions were themed around the 2010 Soccer World Cup, which had taken place in South Africa earlier that year, making it familiar to most participants.

Figure 6.1 The two-roomed training VE, as it was first seen by participants (left). Participants were asked to practice using the mouse to look around and, then, to use the navigational controls to move through the short corridor ahead of them into the second room (right).

Training started with basic navigation controls: the use of the mouse to look around a VE, the keyboard for moving around and the right hand Shift key for sitting and standing. In the training VE, participants began in a small room, shown in Figure 6.1, and were first asked to practice using the mouse to look around. Once they were comfortable with that, they were encouraged to use the keyboard to navigate down the short corridor in front of them to the second room, also shown in Figure 6.1, where they were invited to practice sitting. Participants were each provided with a sheet, shown in Appendix D, Section D.2, reiterating the basic navigational controls in case they needed a reminder while using the prototype.

Next, we explained that, in the storytelling VE, participants would encounter two storytellers with whom they could interact. Exchange structure and questions were described in full, depending on the session's experimental condition, and participants were allowed to practice them in the training VE. The training VE contained two exchange structures. Figure 6.2 shows screenshots from the first, which began with the text, "Which country won the 2010 Soccer World Cup?" displayed on the top of the screen. We expected most participants to know the correct answer (Spain), but, they were encouraged to see what happened when they input an incorrect answer. There were three non-terminating answers that the VE recognised specifically: entering South Africa led to the text "South Africa played well, but, no, they didn't win"; entering Uruguay led to "No, not Uruguay"; entering Germany to "No, Germany came close but it wasn't them"; and entering anything else resulted in "No, try again.". We also encouraged them to see what happened when they pressed Escape instead of inputting an answer or let the input typing box timeout. Here they would have noted that the VE would provide its own answers textually. For example, if they pressed Escape, "Was it Germany?" was displayed on the screen, followed by the response "No, Germany came close but it wasn't them". Next, we asked participants to enter Spain which led to response "Yes, Spain won for the first time in history" and the end of the exchange structure. The second exchange structure posed the question "Which African country got the furthest in the 2010 World Cup?". The correct answer was Ghana, and the exchange structure could also give specific responses and non-user answers for Senegal, Nigeria and South Africa. We encouraged participants to practice this exchange structure more independently.

The training VE was equipped with three questions: one about which country placed third in the World Cup and a question each about where the semi-finals and finals took place. These were structured as a question opportunity, but we made it clear that questions could be asked during a story, whenever the "You may press SPACE to put up your hand" prompt was displayed. There were three different question invitations and "Yes?" was displayed to acknowledge users' hand ups. For unrecognised questions either "I don't know" or "Don't know the answer to that one" was displayed. As with the exchange structure training, the experimenter encouraged participants to allow time-outs to see that the VE could provide non-user questions and answers. The experimenter also asked users to enter a question that was not related to World Cup team placing or venues to see what would happen if the VE didn't recognise their question.

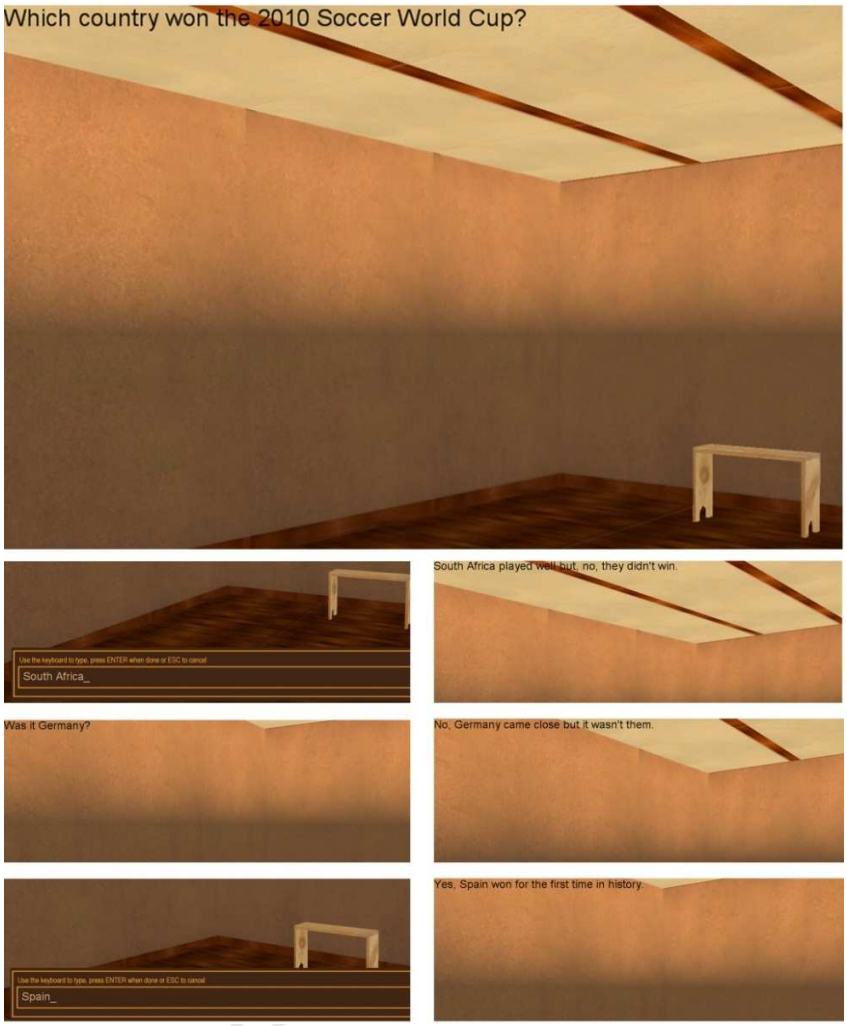


Figure 6.2 Screenshots from the training VE's first, of two, text-based exchange structures. It was initiated by the question "Which country won the 2010 Soccer World Cup?" (top). Participants were encouraged to try entering an incorrect answer, an example of this is shown second from the top. They were also encouraged to see what happened if they pressed Escape, instead of typing into the input box, or if they allowed the input box to timeout. An instance of this is shown in the pair of screenshots third from the top, where the VE offers the answer "Was it Germany?" and responds to the answer with "No, Germany came close but it wasn't them". The bottom pair of screenshots shows the input of the correct answer and the VE's response.

Finally, the experimenter explained the selection of story objects to trigger narratives. For *PO* condition sessions, we explained that the storyteller agents would first tell one story each and, thereafter, participants could select any pulsating object in the VE to hear more stories. In *O* condition sessions, we explained that all the stories could be triggered by selecting the pulsating objects. Of course, for *P* condition sessions, story objects were not mentioned. The training VE allowed participants to practice story object selection by making the bench in the VE a pulsating, selectable object. Once the bench had been successfully selected the text "You selected the bench. Well done!" was displayed and the VE's lights faded downs and it exited automatically. Screenshots from this are shown in Figure 6.3 below.

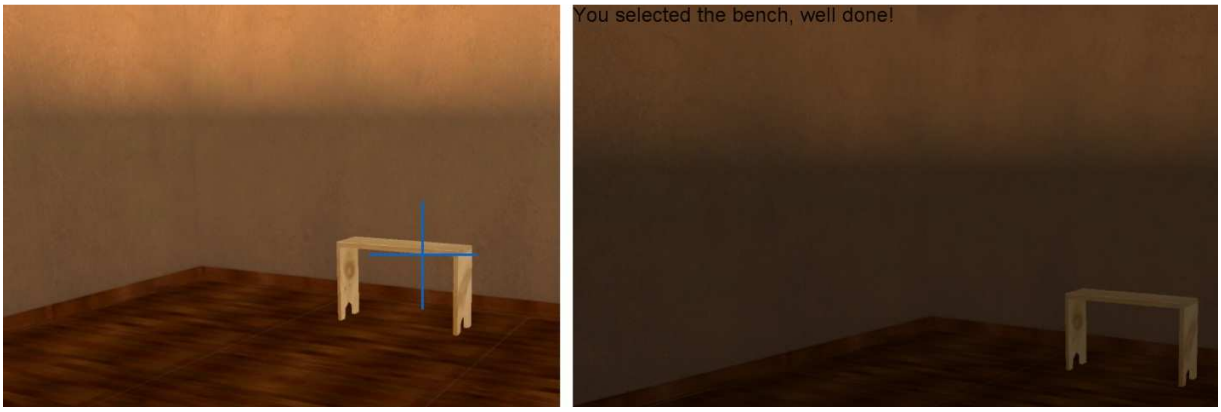


Figure 6.3 Screenshots from the story object selection part training. The bench in this VE was presented as a pulsating object and the participants practiced using the mouse to aim the blue cross onto bench and then click (left). Successful selection was acknowledged textually and the VE faded to black and exited automatically (right).

Contextualisation:

The next step was to provide participants with some context for the storytelling VE. The previous chapter, Section 5.5.3, described a demonstration of an early version of prototype to the District Six Museum staff. They advised that Joe and Noor's narratives required more contextualisation so that listeners would realize that their narratives told of only two experiences out of thousands. Hence, each participant was provided with the following to read over before experiencing the prototype:

> *During Apartheid the Group Areas Act led to the declaration of racially segregated neighbourhoods. In the case of neighbourhoods which were declared "white-only", people of other races groups were forcibly removed from their homes. Forced home removals took place across South Africa and one example is District Six, a Cape Town suburb which used to have a multi-racial mix of residents. It was declared a whites-only neighbourhood and residents were forced to leave their homes and many were relocated to the Cape Flats. Most of the houses and buildings in District Six were demolished. Tens of thousands of people were forcibly removed from District Six. Today you will be hearing the stories of two of these ex-residents: Joe and Noor.*

Storytelling VE:

At this point, the storytelling VE was visible on everyone's displays. The experimenter explained that the two standing figures represented the Joe and Noor mentioned in the context piece and that they would begin by introducing themselves after which the storytelling would be begin. For the *PO* condition, we also explained that after two stories had been told, the VE's lights would fade down and up and pulsing story objects would be available for selection. Participants were asked to put on the headphones provided and press Enter. They were then left to experience the storytelling VE while the experimenter sat quietly in the room. Once all five narratives were complete the prototype exited automatically.

Questionnaire, Payment and Debriefing:

As each participant's prototype exited, the experimenter handed out the questionnaire to complete quietly. Once they finished, they were paid and thanked for their participation.

6.7. Summary

This chapter describes our approach to evaluating the digital storytelling design developed and prototyped in the previous chapter. Our evaluation targeted the two main design ideas, the user-storyteller interactions and story objects through Study Two and Three, respectively. Furthermore, these studies tested the effect that including user-storyteller interactions and story objects had on user's *story experience.* In previous work, we conceived of story experience as a multi-dimensional construct encompassing various aspects of experiencing a narrative in the domain of cultural heritage. We considered an effective story experience to be one in which an interest in the narrative's cultural context is fostered, the user experiences enjoyment of and pays attention to the narrative content and the storytelling is perceived as real. Additionally, an effective story experience should also feature low levels of boredom and confusion. Story experience was measured using a questionnaire developed in previous work and adapted for our current work. The questionnaire also gathered demographic data and qualitative feedback. We also logged user activity in order to observe patterns in how participants actually partook in the user-storyteller interactions. We used a 2x2 factorial design in Study Two that would allow us to compare the story experience of participants who experienced questions and exchange structures with those who do not. Additionally, this design would allow us to test for interactions between questions and exchange structures. In Study Three we used a 3x1 design allowing us to compare story experience in three different conditions: one with no story objects, where all the narratives are told in a predetermined order; one in which the first two narratives are told in a predetermined order, followed by three narratives accessible via story objects; and one in which all five narratives could be trigged by selecting story objects. We drew a cumulative sample of 150 university students for both studies. Additionally the same experimental procedure use for both studies: participants signed a consent form which explained the conditions of their participation; they were trained in the use of the prototype; they were given a context piece to read about District Six and the Apartheid-era forced removals; they then experienced the prototype independently; they completed the questionnaire; finally, they were paid and debriefed. In the next chapter we present the results of Studies Two and Three.

Chapter 7

Studies Two & Three: Results

This chapter describes the results of Study Two and Three, where we aimed to answer our second and third research questions, respectively, and gain an overall sense of how the prototype was received by participants. Section 7.1 describes ad-hoc observations from the experiments which gave an initial sense of participants' reactions to the prototype. Next, we present a number of preliminary analyses done before tackling the main task of answering our research questions: in Section 7.2, the sample's demographic data; in Section 7.3, a psychometric analysis of the questionnaire used in both studies; in Section 7.4, descriptive statistics of both studies' dependent variables. Section 7.5 presents Study Two's results including the effect of questions and exchange structures on story experience and an account, based on usage logs, of how participants partook in these interactions. Section 7.6 presents Study Three's results on the effect of story objects on story experience. Section 7.7 describes participants' qualitative feedback and Section 7.8 gives a comprehensive summary of both studies' main findings.

7.1. Ad-hoc Observations

Since the main researcher was in the experiment room while participants used the prototype (in case of any technical problems and to hand out the questionnaires), we were able to observe participants behaviours while using the prototype and hear any feedback that arose at the end of experiment sessions. Firstly, we heard many compliments as participants handed back questionnaires. They often wanted to find out more about the project and, in some cases, whether the prototype would be publically available in the future. A few even asked to take the contextualisation page with them – which may be interpreted as a sign of interest in reading more about District Six post-experiment.

Secondly, some behaviour suggested enjoyment while using the prototype. A number giggled periodically, some even broke out into full laughter (most likely upon hearing the more comedic narrative content). There were audible exclamations and gasps – especially during the *Group Areas and Mixed Marriages Acts* narrative and at the moment when the Richmond Street panel swivelled during the *Richmond Street* narrative. One participant, who later told us that he lives in the Cape Flats, laughed, exclaimed and stomped his foot in response to the Bloemhof Flats to Cape Flats narrative (which contained some jokes about living in the Cape Flats). A handful of participants took notes while listening to the stories. We asked two participants why they did this; one thought they might be tested on the content later and another said the notes were for their own interest. While enjoyment seemed to be the predominant reaction there were also participants whose body language suggested that they were bored.

Thirdly, most participants appeared to pay attention to the storyteller agents, keeping their point of view focused on them or the VE's picture objects. But, occasionally, we observed participants who,

in addition to appearing bored, spent much of their time moving around VE, without focusing on the storyteller agents. We could also tell that many participants heard "I don't know" responses to their questions. A few had more success when they used the hints, but some took this to extent of waiting for the hints to appear and then entering only single keywords, rather than full questions. With exchange structures, we noticed a handful of participants do something unexpected: instead of inputting answer attempts they tried to indicate that they did *not* know the answer to a storyteller agent's question by typing, for example, "No" or "I don't know". We had not anticipated this, so the prototype was unable to response appropriately to such inputs. We also noticed misspelled inputs which the agents were not equipped to recognise, particularly in the exchange structures about township names. Sometimes participants clearly knew correct answers, but could not spell them, resulting in their inputs not being recognised. Qualitative feedback late revealed that this was frustrating. Other participants used abbreviated text message style words such as "u" instead of "you" or omitting vowels (e.g. "wud" instead of "would"). Most unconventionally spelled words were not keywords and, so, did not affect the storyteller agents' responses. But, occasionally it prevented users from getting the intended agent responses, since the prototype could not recognise these misspellings.

7.2. Demographic Data

We collected a range of data, which we thought might affect participants' response to the prototype and its Apartheid-themed content: year of study, faculty, age, gender, nationality, hometown, race and whether they had visited the District Six Museum or studied District Six at school. All participants were undergraduate students, with the exception of 2 university staff members. This sample covered a range in terms of year of study (first year: 46; second year: 41; third year: 34; fourth year: 10) and faculty (Commerce: 9; Engineering: 24; Humanities: 27; Science: 83). Ages ranged from 18 to 44, with an average age of 21. Sixty-four participants were female and 81 male. Most participants (106) were South African, while the rest come from a variety of African countries and a handful from non-African countries. To make the hometown data meaningful, we created a number of hometown categories. South African hometowns were categorised according to province. The sample represented six of South Africa's nine provinces, namely Western Cape (where Cape Town and District Six are located), Limpopo, Gauteng, Eastern Cape, Mpumalanga and Kwazulu Natal. Some listed "South Africa" as their hometown; these were noted in a separate category. African hometowns outside of South Africa were noted in the "Other African town" category while European and American hometowns were noted in their own categories. Most participants were from the Western Cape (38), Gauteng (21) and other African countries (33). Given the Apartheid content of the studies, we were interested in the race names participants would use to classify themselves and we wanted to control for race as a possible influence in later analyses. Our questionnaire did not specify race categories, but allowed participants to write down a race. Most used classical race categories such as "Black", "White" and "Coloured", while a few identified their race through responses like "Other" or, even "Hybrid"; these were gathered into a category entitled "Other". Four participants specified ethnicities such as "Indian", "Xhosa" and "Zulu". Appendix D, Section D.4 gives counts for nationality, hometown and race. Only 21 participants had previously visited the District Six Museum while 43 had studied District Six related literature at school.

7.3. Psychometric Analysis

We created our own questionnaire for measuring control variables, Existing Knowledge (*EK)* and Interest Tendency (*IT)*, and dependent variables, Interest *(Int),* Enjoyment *(Enj),* Attention *(Att),* Boredom *(Bor),* Confusion *(Con)* and Storytelling Realism *(SR)*. Therefore, before conducting analyses with these variables, we conducted a thorough psychometric analysis of our questionnaire's quantitative scales (i.e. those measured on 7-point Likert scales). This step would determine if we could use the data measured by our questionnaire and would help us identify any unsound data that should be excluded. Three or more items were used to measure the control and dependent variables. We considered each of these as distinct scales within the questionnaire and analysed each separately. Since Study Two and Three used the same scales, we combined their data to form the largest possible sample (n = 145). Data points with any missing values were omitted.

7.3.1. Validity & Reliability

There are two main properties to consider in judging a scale's soundness: validity and reliability. Validity encompasses two different properties of a scale. Construct validity is a qualitative judgement of the extent to which a scale's items measured the intended phenomenon, instead of unintentionally measuring something else. Concurrent validity quantitatively measures of the extent to which different items appear to measure the *same* factor by examining inter-item correlations (Anastasi, 1982). Reliability refers to the consistency of the scores obtained on a scale when used in different studies or the extent to which a scale's items agree on the measurement of a factor (Anastasi, 1982). In other words, reliability is the extent to which different items *agree* on the measurement of a factor; this may also be termed inter-item consistency (Anastasi, 1982; Cronbach, 1990). For continuous scales, such as ours, reliability is calculated by Cronbach's alpha coefficient whose values range between 0 and 1 (Cronbach, 1951). With a considerable sample size (greater than 100), a value of 0.7 or higher is widely considered an acceptable indicator of reliability (Nunnally, 1978). Cronbach's alpha coefficient is additionally useful for determining which of a scale's items decrease the reliability and are, hence, candidates for exclusion. We examined each scale's concurrent validity and reliability. There were three possible outcomes for each analysis. In the best case, a scale would show acceptable concurrent validity and reliability and we used its data as it. Alternatively, the scale is not valid or reliable, but could be refined into a valid and reliable measure by excluding certain items. Or, none of the items could be made to form a valid, reliable scale, in which case we would have to exclude the scale's data altogether.

7.3.2. Existing Knowledge & Interest Tendency Scales

The three items measuring *EK* correlated positively showing concurrent validity. The correlations are shown in Table 7.1. Cronbach's alpha coefficient was 0.69 (n = 144) indicating reliability. The *IT* scale, as shown in Table 7.2 below, showed concurrent validity, with positive correlations amongst all three items, and reliability with a Cronbach's alpha coefficient of 0.84 (n = 145).

	EK Item 1	*EK Item 2*	*EK Item 3*
EK Item 1	1.0	***0.17***	***0.76***
EK Item 2		1.0	***0.27***
EK Item 3			1.0

Table 7.1 Correlation matrix showing significant positive correlations among the scores for items measuring Existing Knowledge (*EK*). Significant correlations ($p < 0.05$, n = 144) are shown in bold and italic.

	IT Item 1	*IT Item 2*	*IT Item 3*
IT Item 1	1.0	***0.60***	***0.49***
IT Item 2		1.0	***0.80***
IT Item 3			1.0

Table 7.2 Correlation matrix showing significant positive correlations among the scores for items measuring Interest Tendency (*IT*). Significant correlations ($p < 0.05$, n = 145) are shown in bold and italic.

7.3.3. The Story Experience Scales

Interest:

In our previous work, the *Int* scale was our most successful story experience scale. Here, it also fared well, but showed that it could be refined even further. Table 7.3 shows that all its items correlated positively, with the exception of the second item.

	Int Item 1	*Int Item 2*	*Int Item 3*	*Int Item 4*	*Int Item 5*	*Int Item 6*	*Int Item 7*	*Int Item 8*	*Int Item 9*
Int Item 1	1.0	0.13	***0.50***	***0.70***	***0.59***	***0.45***	***0.48***	***0.30***	***0.66***
Int Item 2		1.0	0.06	***0.21***	0.12	0.16	0.16	0.15	0.13
Int Item 3			1.0	***0.48***	***0.41***	***0.33***	***0.23***	***0.37***	***0.38***
Int Item 4				1.0	***0.71***	***0.48***	***0.44***	***0.30***	***0.64***
Int Item 5					1.0	***0.34***	***0.50***	***0.43***	***0.50***
Int Item 6						1.0	***0.34***	***0.19***	***0.44***
Int Item 7							1.0	***0.40***	***0.44***
Int Item 8								1.0	***0.29***
Int Item 9									1.0

Table 7.3 Correlation matrix showing significant positive correlations among the scores for items measuring Interest (*Int*), with the exception of Item 2, which was ultimately removed from the scale. Significant correlations ($p < 0.05$, n = 143) are shown in bold and italic. Borderline significant correlations ($p = 0.05$) are underlined.

There was a Cronbach's alpha coefficient of 0.82. But, removing Item 2 this (already acceptable) value improved to 0.85. This removal produced a valid and reliable eight-item scale. We posit three reasons for why Item 2 performed poorly:

> *Reading a book about the forced removals would be very little fun for me.*

First, the combination of negative and positive wording "very little fun" may have confused participants. Second, the item mentioned "forced removals" alone whereas five of the other *Int* items referred to "District Six" or "South African history". Furthermore, the two other items which mentioned "forced removals" did so in conjunction with "District Six" and "Apartheid". It is possible that measuring interest in District Six and Apartheid was distinct from an interest in the forced removals. Thirdly, this item deals with reading which may not have been as appealing as listening to

stories, attending museum exhibits or watching videos, which were mentioned in Items 1, 3 and 8. However, Item 6, which performed well while showing a borderline correlation with Item 2, did mention seeking out District Six books. For future work, our sense is that the negative wording of this item should be disambiguated and it should not mention "forced removals" alone, but either "District Six" or "Apartheid" should be added.

Enjoyment:

The three-item *Enj* scale performed well with all the items correlating positively (see Table 7.4) and a Cronbach's alpha coefficient of 0.66. Rounded up to 0.7 this showed acceptable reliability.

	Enj Item 1	*Enj Item 2*	*Enj Item 3*
Enj Item 1	1.0	***0.40***	***0.51***
Enj Item 2		1.0	***0.35***
Enj Item 3			1.0

Table 7.4 Correlation matrix showing significant positive correlations among the scores for items measuring Enjoyment (*Enj*). Significant correlations ($p < 0.05$, n = 145) are shown in bold and italic.

Attention, Boredom and Engagement:

The *Att* scale proved neither valid nor reliable with two, of three, items correlating significantly and a Cronbach's alpha coefficient of 0.33.

	Att Item 1	*Att Item 2*	*Att Item 3*
Att Item 1	1.0	***0.44***	0.04
Att Item 2		1.0	0.08
Att Item 3			1.0

Table 7.5 Correlation matrix showing only one significant positive correlation in the Attention (*Att*) scale. The significant correlation ($p < 0.05$, n = 144) is shown in bold and italic.

The inter-item correlations, shown in Table 7.5 above, suggested that the third item in the *Att* scale was the odd one out:

> *I spent most of the time looking at the storytellers.*

This item assumes that visually focusing on the storyteller agents suggests attention to the storytelling. However, since this did not correlate with items which directly inquired into the attention to the storytelling and storytellers, this assumption may be inaccurate. It is possible that spending time looking at the narrative-related objects in the VE also indicated attention to the storytelling. Overall, we conclude that the attention scale was not psychometrically sound. The *Bor* scale showed concurrent validity (see Table 7.6) and acceptable reliability with a Cronbach's alpha coefficient of 0.69. However, further reflection on the boredom and attention led us to consider that these two scales measured two sides of the same coin – one was concerned with holding a listener's attention and the other with failing to hold attention. Thus, we constructed a new scale composed of the *Bor* item scores reversed and the *Att* items. Table 7.7 shows that all the items in this new scale correlated positively, with the exception of the third attention item. This scale had a Cronbach's alpha coefficient of 0.70; removing *Att Item 3*, increased this value to 0.80 suggesting a more reliable scale. Therefore, for analysis, we no longer considered attention (*Att*) and boredom (*Bor*) as two

distinct variables, but combined them to form Engagement[16] (*Eng*) as measured by the newly-formed, valid and reliable, five-item scale.

	Bor Item 1	*Bor Item 2*	*Bor Item 3*
Bor Item 1	1.0	***0.55***	***0.37***
Bor Item 2		1.0	***0.43***
Bor Item 3			1.0

Table 7.6 Correlation matrix showing significant positive correlations among the scores for items measuring Boredom (*Bor*). Significant correlations ($p < 0.05$, n = 143) are shown in bold and italic.

	Bor Item 1 (reversed	*Bor Item 2 (reversed)*	*Bor Item 3 (reversed)*	*Att Item 1*	*Att Item 2*	*Att Item 3*
Bor Item 1 (reversed)	1.0	***0.55***	***0.36***	***0.51***	***0.42***	0.14
Bor Item 2 (reversed)		1.0	***0.42***	***0.57***	***0.51***	0.05
Bor Item 3 (reversed)			1.0	***0.53***	***0.29***	0.06
Att Item 1				1.0	***0.45***	0.05
Att Item 2					1.0	0.07
Att Item 3						1.0

Table 7.7 Correlation matrix showing significant positive correlations between Boredom (*Bor*) scale's items reversed and the Attention (*Att*) scale's items. Significant correlations ($p < 0.05$, n = 143) are shown in bold and italic.

Confusion:

The *Con* scale showed concurrent validity (see Table 7.8), but a Cronbach's alpha coefficient of only 0.61. Since this scale was not reliable, we excluded *Con* from further analyses. The inter-item correlations give little clue of which item(s) were problematic. This scale could likely be improved by adding more items, since number of items influences reliability (Cronbach, 1951; Cronbach, 1990).

	Con Item 1	*Con Item 2*	*Con Item 3*
Con Item 1	1.0	***0.48***	***0.24***
Con Item 2		1.0	***0.44***
Con Item 3			1.0

Table 7.8 Correlation matrix showing significant positive correlations among the scores for items measuring Confusion (*Con*). Significant correlations ($p < 0.05$, n = 145) are shown in bold and italic.

Storytelling Realism:

All of the *SR* scale items correlated positively, as shown in Table 7.9, showing concurrent validity, and the scale had a Cronbach's alpha coefficient of 0.71, showing reliability.

	SR Item 1	*SR Item 2*	*SR Item 3*
SR Item 1	1.0	***0.40***	***0.47***
SR Item 2		1.0	***0.53***
SR Item 3			1.0

Table 7.9 Correlation matrix showing significant positive correlations between Storytelling Realism (*SR*) scale's items. Significant correlations ($p < 0.05$, n = 145) are shown in bold and italic.

[16] Since *Engagement* encompassed the capturing of attention and an absence of boredom.

7.4. Story Experience: Descriptive Statistics

In Studies Two and Three we normalised control and dependent variable scores to be out of 100 in order to make comparing them easier. We inspected scores for Study Two and Three combined (n = 145), looking at descriptive statistics of each variable. Table 7.10 shows the descriptive statistics for *EK, IT, Int*; *Enj*; *Eng* and *SR*.

Variable	*Minimum*	*Median*	*Mean*	*Std. Dev.*	*Maximum*
EK	14.29	80.95	70.25	25.93	100.00
IT	14.29	76.79	75.32	16.50	100.00
Int	14.29	78.57	76.50	16.71	100.00
Enj	14.29	90.48	83.97	14.87	100.00
Eng	17.14	91.43	86.76	13.59	100.00
SR	14.29	85.71	80.03	17.10	100.00

Table 7.10 Combined descriptive statistics for Study Two and Three (n=145). This table summarises the control variables, namely Existing Knowledge (*EK*) and Interest Tendency (*IT*), and dependent variables, namely Interest (*Int*), Enjoyment (*Enj*), Engagement (*Eng*) and Storytelling Realism (*SR*).

The high *EK* and *IT* scores indicated that our sample was predisposed to responding well to District Six related narratives. This was not surprising since we had advertised our study as a District Six storytelling study. Most of our sample felt they already knew about District Six and Apartheid, as evidenced by a high *EK* mean score of 70.25. They also reported markedly high tendencies towards showing interest in personal stories and South African history. Seventy-five percent of *IT* scores were above 66 and the distribution of *IT* scores were significantly leptokurtic, i.e. peaked, (kurtosis=1.78, $p < 0.001$). The probability distribution in Figure 7.1 shows that *IT* scores were clustered around 80-100, and a boxplot showed that scores between 0-40 were sample outliers.

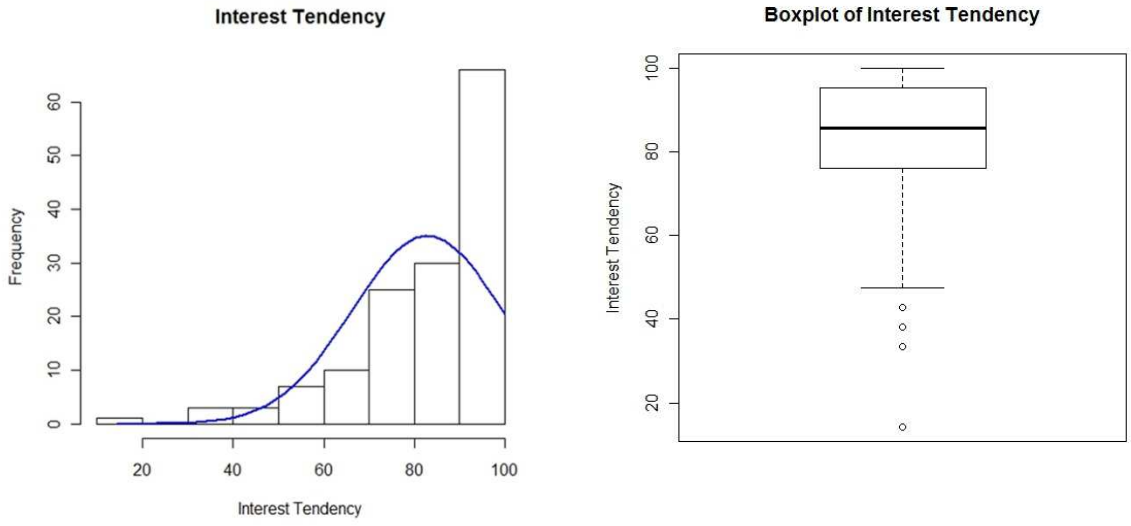


Figure 7.1 The distribution of Interest Tendency (*IT*) scores (n=145). The right-hand graph shows a histogram with the probability distribution. This distribution was significantly non-normal (W=0.88, $p < 0.001$) and leptokurtic (kurtosis = 1.78) such that *IT* scores were clustered at the top of the domain. The left-hand graph shows a boxplot which illustrates that lower *IT* scores between 0 and 40 were outliers in this sample.

The *EK* and *IT* scores suggested that the participants would respond positively to the prototype's narratives. Indeed, the overall pattern for the dependent variables suggested overwhelmingly

positive story experiences. Table 7.10 above shows that all story experience scores had means greater than 76. Furthermore, there was a consistent pattern of *Int, Enj, Eng* and *SR* scores being significantly non-normally distributed and exhibiting some skew towards higher scores. Testing for skew and kurtosis showed that the distributions for all these variables were significantly leptokurtic, meaning that the distributions were significantly peaked. Table 7.11 shows the Shapiro-Wilks normality test results as well as the skew and kurtosis values for the dependent variables. Figure 7.2 shows the similarity across the distributions of story experience scores. In particular, these graphs show that story experience scores tended to cluster around higher values.

Variable	***Shapiro-Wilks normality Test***	***Skew***	***Kurtosis***
Int	***W = 0.92, p < 0.001***	-1.14	***1.99***
Enj	***W = 0.87, p < 0.001***	-1.39	***2.78***
Eng	***W = 0.83, p < 0.001***	-1.90	***5.58***
SR	***W = 0.89, p < 0.001***	-1.19	***1.37***

Table 7.11 The outcomes of testing for normality, skew and kurtosis of story experience scores: Interest (*Int*), Enjoyment (*Enj*), Engagement (*Eng*) and Storytelling Realism (*SR*). Significant results ($p < 0.05$, n = 145) are shown in bold and italics. All scores were significantly non-normally distributed and leptokurtic (indicated by positive kurtosis values).

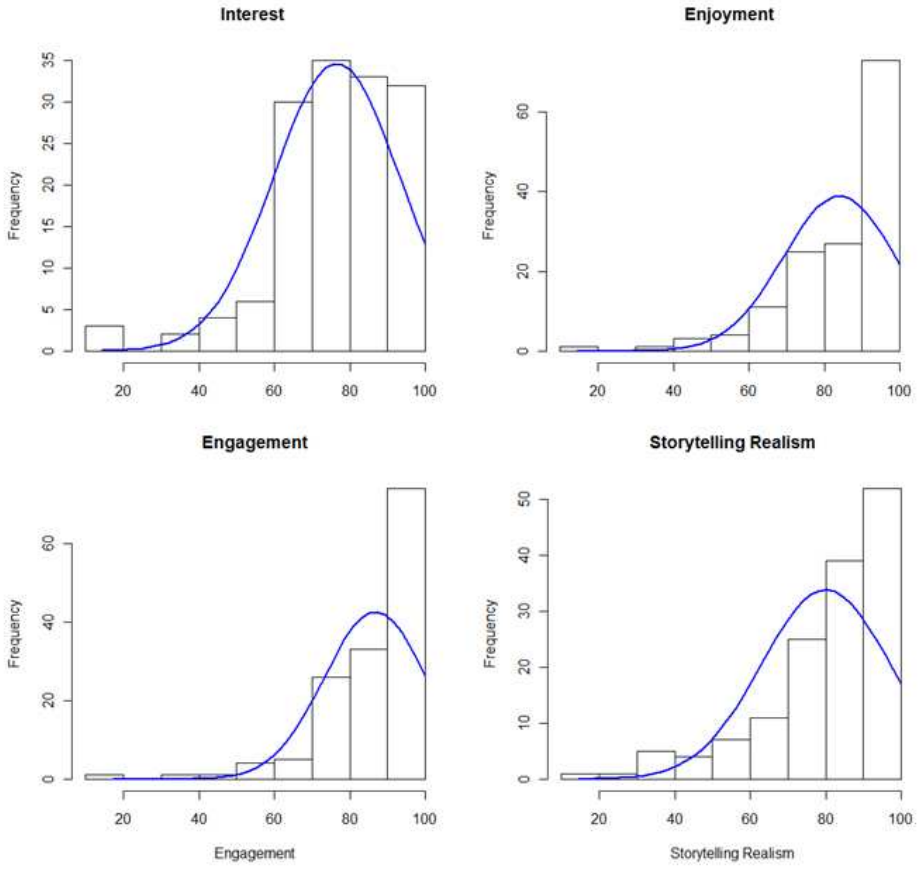


Figure 7.2 Histograms and probability distributions for story experience scores (n=145). All scores were significantly non-normal and leptokurtic.

Finally, we inspected correlations amongst the control and dependent variables; these are shown in Table 7.12. Our interest in these correlations was twofold. Firstly, we wanted to see if our control variables showed any relation to the dependent variables. *EK* did not correlate any aspect of story experience while *IT* correlated positively with every story experience variable. Secondly, we wanted to see if our conceptualisation of story experience was reflected in how our dependent variables correlated. We expected all the story experience scores would correlate significantly with each other and they did, reinforcing our story experience conceptualisation.

	EK	*IT*	*Int*	*Enj*	*Eng*	*SR*
EK	1.0	-0.06	-0.06	0.05	0.05	0.09
IT		1.0	***0.71***	***0.28***	***0.38***	***0.24***
Int			1.0	***0.47***	***0.50***	***0.26***
Enj				1.0	***0.61***	***0.21***
Eng					1.0	***0.34***
SR						1.0

Table 7.12 Correlation matrix for the control variables, Existing Knowledge (*EK*) and Interest Tendency (*IT*), and dependent variables, Interest (*Int*), Enjoyment (*Enj*), Engagement (*Eng*) and Storytelling Realism (*SR*). Significant correlations ($p < 0.05$, n = 145) are shown in bold and italics

7.5. Study Two: Questions & Exchange Structures

Study Two explored the effectiveness of two types of user-storyteller agent interactions, namely questions and exchange structure. We tested the effect of the following two independent variables on story experience:

- ***Questions* (*Que*):** in *Q* conditions users were able to ask questions and in the *NQ* conditions they could not
- ***Exchange Structures* (*ES*):** the *E* conditions featured interactive exchange structures while in the *NE* conditions users could hear, but not participate in, exchange structure interactions taking place between the storyteller agents and virtual audience.

We used a 2x2 factorial between-subjects design such that we the compared the story experience in the following four different conditions; this design also allowed us to test for interaction effects between *Que* and *ES*:

5. ***Q+E*:** The VE with both questions (*Q*) and exchange structures (*E*).
6. ***Q+NE:*** The VE with questions (*Q*) and no exchange structures (*NE*).
7. ***NQ+E*:** The VE with no questions (*NQ*) and with exchange structures (*E*).
8. ***NQ+NE*:** The VE with no questions (*NQ*) and no exchange structures (*NE*).

Results of these analyses are presented in Section 7.5.1. In Section 7.5.2, we describe patterns in how participants actually partook in questions and exchange structures.

7.5.1. Effect on Story Experience

We used generalised linear models to test for the effect of *Que* and *ES* on *Int*, *Enj*, *Eng* and *SR*. This allowed us to control for *EK, IT* current year of study, faculty, age, gender, nationality, hometown, race and whether participants had visited the District Six Museum or studied District Six at school.

Interest:

A significant linear model for *Int* ($F = 35.33$, $R^2 = 0.522$, $p < 0.001$), summarised in Table 7.13, showed that *Que*, *ES* and *IT,* as significant predictors*. IT* was, by far, the most significant predictor and the regression coefficient ($t = 9.71$) between *IT* and *Int* indicated a positive relationship where high *IT* scores predicted higher *Int* scores. The means plot for *Int* in the *Q* and *NQ* conditions shown in Figure 7.3 indicated that *Int* was significantly greater in the *Q* condition. Figure 7.4 shows that *Int* was significantly greater for users who were experienced exchange structures in the *E* condition, in comparison to those who did not.

Int predictor	***F value***	***p***
Que	***5.72***	***0.02***
ES	***6.00***	***0.02***
IT	***94.26***	***< 0.001***

Table 7.13 A summary of the predictors in the linear model for Interest (*Int*) (F = 35.33, R^2 = 0.522, *p* < 0.001) in Study Two. Significant predictors are shown in bold and italics. Here, Questions (*Que*), Exchange Structures (*ES*) and Interest Tendency (*IT*), were significant predictors.

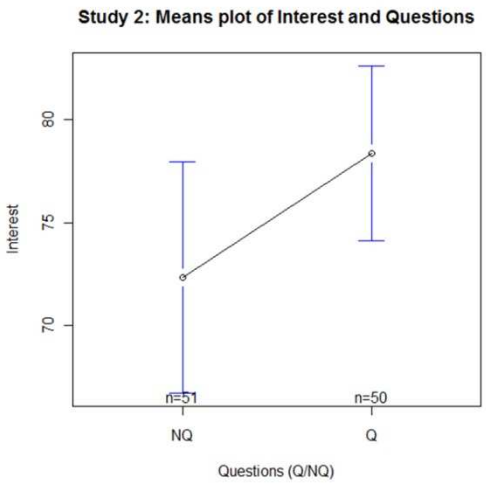


Figure 7.3 Means plot showing the effect of *Questions* on *Interest* in Study Two. Interest was significantly higher for those who could input questions (*Q*) as opposed to those would not (*NQ*).

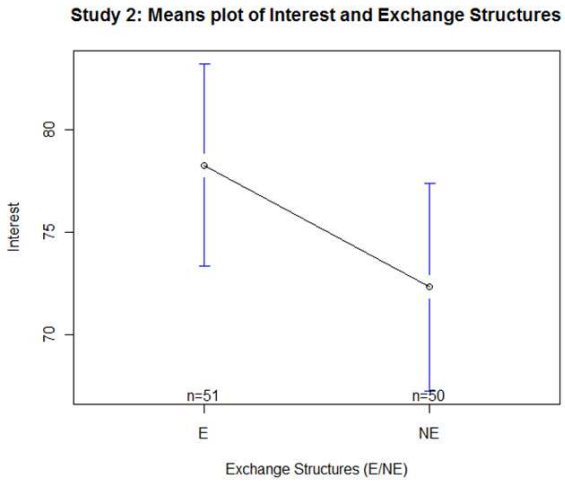


Figure 7.4 Means plot showing the effect of *Exchange Structures* on *Interest* in Study Two. Interest was significantly higher where interactive exchange structures were included (*E*) as opposed to not (*NE*).

Enjoyment:

The linear model for *Enj* also showed that *Que*, *ES* and *IT* were predictors *(F* = 4.41, R^2 = 0.12*, p* = 0.006). Table 7.14 shows that *IT* and *ES* were both significant predictors while *Que* was borderline significant. Once again, a positive regression coefficient (*t* = 2.44) showed that high *IT* scores predicted for high *Enj* scores. The means plot in Figure 7.5, shows that *Enj* was significantly greater in *E* condition, where exchange structures were present, compared to *NE*.

Enj predictor	***F value***	***p***
Que	*3.15*	*0.08*
ES	***4.14***	***0.04***
IT	***5.94***	***0.02***

Table 7.14 A summary of the predictors in the linear model for Enjoyment (*Enj*) (F = 4.41, R2 = 0.12, *p* = 0.006) in Study Two. Significant predictors, Exchange Structures (*ES*) and Interest Tendency (*IT*), are shown in bold and italics. Questions (*Que*), shown in italics, was a borderline significant predictor.

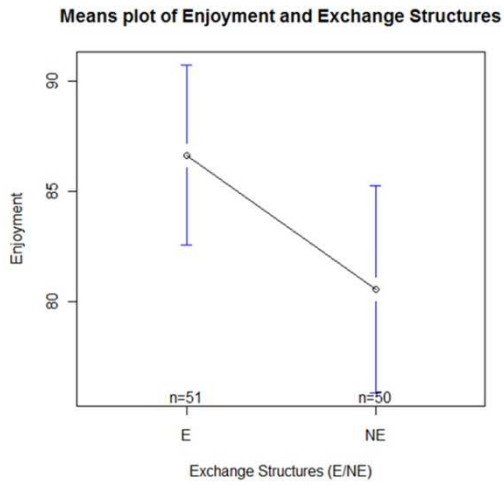


Figure 7.5 Means plot showing the effect of *Exchange Structures* on *Enjoyment* in Study Two. Enjoyment was significantly higher in the E condition, where exchange structures were present, compared to NE.

Eng predictor	*F value*	*p*
Que	***3.92***	***0.05***
ES	***10.53***	***0.002***
IT	***12.39***	***< 0.001***

Table 7.15A summary of the predictors in the linear model for Engagement (*Eng*) (F = 8.85, R^2 = 0.22, *p* < 0.001) in Study Two. All the predictors, Questions (*Que*), Exchange Structures (*ES*) and Interest Tendency (*IT*), were significant and are shown in bold and italics.

Engagement:

Eng followed the same pattern, with a linear model *(F* = 8.95, R^2 = 0.22*, p* < 0.001) made up of *Que*, *ES* and *IT* as predictors; these are summarized in Table 7.15. *IT* and *ES* were, once again, highly significant predictors, while *Que* was just significant. The regression coefficient for *IT* and *Eng* (*t* = 3.52), once again, indicated a positive relationship. The means plot in Figure 7.6 shows that *Eng* was significantly higher when questions were included (the *Q* condition). Figure 7.7 shows that *Eng* was significantly greater when exchange structures were included (the *E* condition).

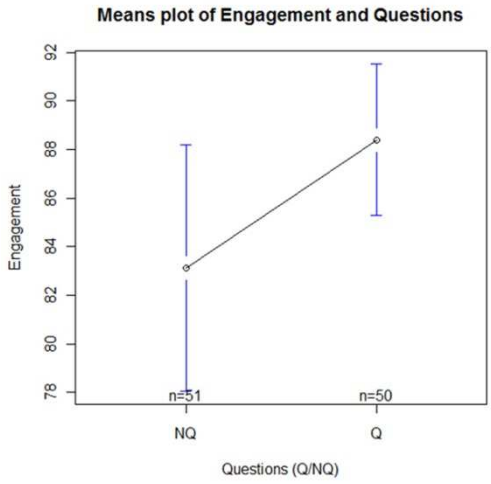


Figure 7.6 Means plot showing the effect of *Questions* on *Engagement* in Study Two. Engagement was significantly higher in the *Q* condition, where questions were present, compared to *NQ*.

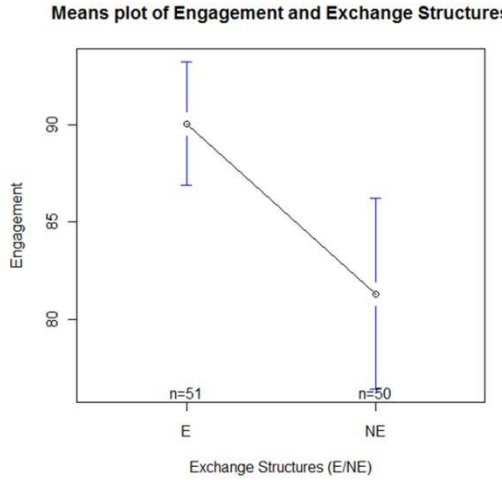


Figure 7.7 Means plot showing the effect of *Exchange Structures* on *Engagement* in Study Two. Engagement was significantly higher in the *E* condition, where exchange structures were present, as opposed to NE.

Storytelling Realism:

The linear model for *SR* (*F* = 3.87, R^2 = 0.17, *p* = 0.003) showed that only *IT* was a significant predictor. However, *ES* was borderline significant, narrowly missing the 0.05 significance level (see Table 7.16). Once again, higher *IT* scores predicted higher *SR* scores (*t* = 2.78).

SR predictor	***F value***	***p***
Que	0.77	0.38
ES	*3.77*	*0.06*
IT	***11.02***	***0.001***
Age	1.39	0.24
Gender	2.40	0.12

Table 7.16 A summary of the predictors in the linear model for Story Realism (*SR*) (F = 3.87, R2 = 0.17, *p* = 0.003) in Study Two. Here, Interest Tendency (*IT*), shown in bold and italics, was a significant predictor while Exchange Structures (*ES*), shown in italics, was borderline significant.

7.5.2. Usage Patterns

We logged participant's interaction during questions and exchange structures in order to see whether they did or did not partake in these interactions get a sense of whether these interactions ran successfully. We were also interested in seeing if there were any links between actual user activity and story experience. Since all of Study Three's conditions included questions and exchange structures, we also inspected those usage logs so that we could draw from a large pool of data.

Questions:

To see how people interacted with questions we looked at all *Q* condition usage logs from Study Two and Three (i.e. the logs of participants who experienced questions), which amounted to a sample of 94. We considered the number of times participants pressed a key to put up their hand (a.k.a. hand-ups) and the number of questions entered. We also considered hand-ups and questions that occurred during story narrations separately to those occurring during question opportunities so we could discern if there were differences between how participants made use of the ability to ask questions at any point during a story *vs.* when invited by storyteller agents. For indicators for low engagement with questions, we looked the number of times question inputs were cancelled (by pressing the Escape key when the question input box was present) and how often question opportunities were allowed to time out. Descriptive statistics for all of these are given in Table 7.17.

Participants put up their hands a mean of 11 times and hand-up amounts ranged from 0 to 31. There was little difference between the number of hand-ups during narratives (mean = 5.07) as opposed to question opportunities (mean = 5.89). The data for hand-ups and questions entered were, necessarily, highly similar since users had to indicate their desire to ask a question, via a hand-up, in order to enter questions. One could reasonably expect that if a user signalled an intention to ask a question, they would be unlikely to opt out of typing in their question. The user logs reflected this showing that almost no one cancelled question input. The distribution for number of questions entered, shown in Figure 7.8, was significantly non-normal (*W* = 0.95, *p* = 0.001), positively skewed (skew = 0.87) and leptokurtic (kurtosis = 1.37). More participants tended to ask less than the mean 10 questions, while a significant number of participants entered around 10 questions.

During question opportunities the storyteller agents invited the user to put up a hand and then wait. If there were no hand-up after five seconds, one of the virtual audience members would ask a question instead. Table 7.17 shows relatively few such timeouts during question opportunities (mean=3.26). There were four question opportunities in the VE, so, on average, there was less than one timeout per question opportunity. We also wanted to know how successful the storyteller agents were at answering users' questions. Unfortunately, on average, they were only able to recognise a third of user-entered questions.

	User activity	***Min***	***Median***	***Mean***	***Max***
Hand-ups:	*During story narration*	0	4	5.07	24
	Question opportunity	0	6	5.89	18
	Total	0	10	10.96	31
Questions Entered:	*During story narration*	0	4	4.76	24
	Question opportunity	0	5	5.74	18
	Total	0	10	10.51	31
	Question cancellations	0	0	0.32	3
	Question opportunity timeouts	0	3	3.26	7
	Recognised questions percentage	0	33.33	35.34	100

Table 7.17 Descriptive statistics for question usage in the *Q* conditions of Studies Two and Three (n = 94).

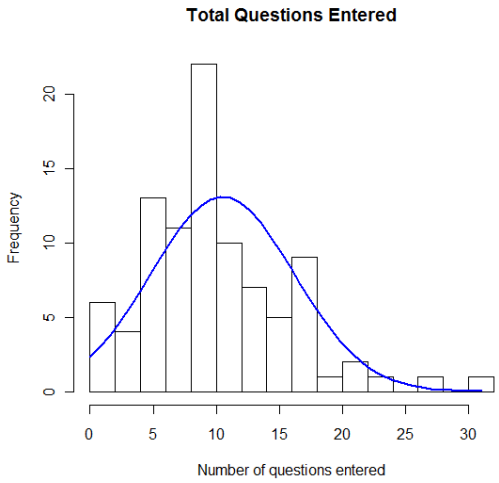


Figure 7.8 A histogram plot showing the total number of questions entered by users in Study Two and Three (n = 94). The probability distribution (also shown) was significantly non-normal (W = 0.95, p = 0.001), positively skewed (skew = 0.87) and leptokurtic (kurtosis = 1.37).

Exchange Structures:

As we did with questions, we analysed *E* condition usage logs from Study Two and Three, giving us a sample of 95. Altogether, the *E* condition prototype presented users with 7 different exchange structures. In judging participants' interaction with these, we looked at the total attempts made at answering exchange structures and the number of time participants opted out of answering (by pressing Escape when the input box was present). Descriptive statistics for this data is given in Table 7.18 below. Overall participants appeared to partake in exchange structures attempting to input answers and making few input cancellations. Graphs for answer attempts and input cancellations are shown in Figure 7.9. Number of answer attempts were normally distributed ($W = 0.98$, $p = 0.09$) with a mean of around 12. Since there were seven exchange structures, this suggests more than one answer attempt per exchange structure. Meanwhile, the distribution of number of input cancellations was positively skewed (skew = 1.12) with the majority of participants making few or no cancellations.

User activity	***Min***	***Median***	***Mean***	***Max***
Answer attempts	5	12	12.15	18
Input cancellations	0	2	3.19	14
Recognised input percentage	11.11	45.45	45.49	85.71
Exchange structures answered by user	0	4	3.97	7

Table 7.18 Descriptive statistics for user activity related to exchange structures for E condition data from Study Two and Three (n = 95).

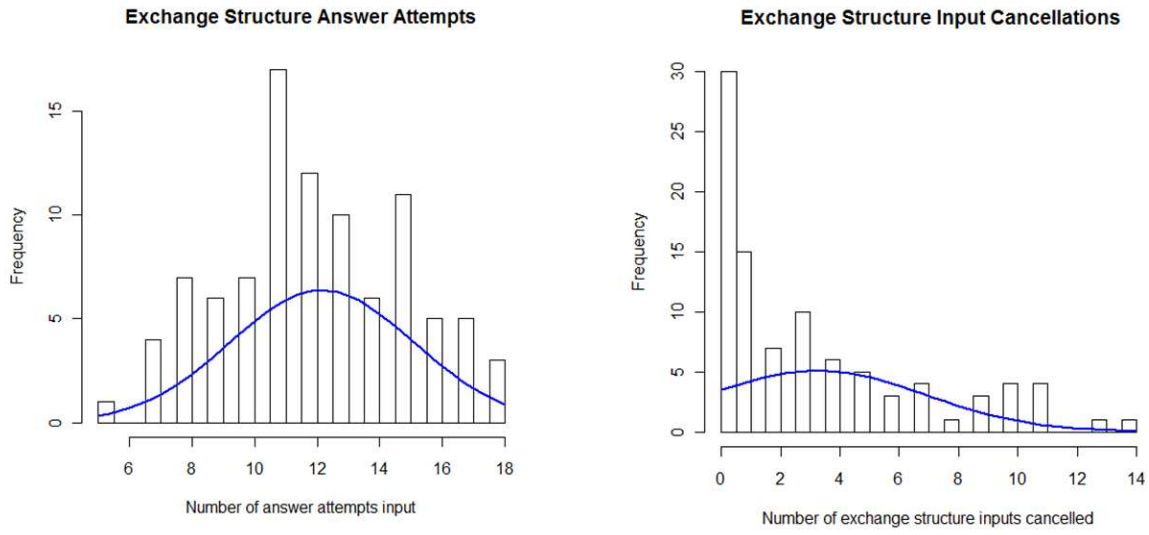


Figure 7.9 Histogram plots showing, on the left, the total number of exchange structure answer attempts and, on the right, the number input cancellations. These graphs also show the probability distribution curve for both. The number of answer attempts was normally distributed (W = 0.98, *p* = 0.09) while input cancellations was significantly non-normal (W = 0.82, *p* < 0.001) and positively skewed (skew = 1.12). This data was drawn from the *E* condition data in Study Two and Three (n = 95).

In judging the success of the exchange structure implementation, we considered the percentage of participants' inputs that were recognised by the storytelling agents as well as the number of exchange structures that were successfully answered (and hence terminated) by participants. Almost half of participant's exchange structure inputs were recognised by the storyteller agents (mean = 45.49%). Participants were able to provide the terminating answers for a mean of 3.97 exchange structures (as opposed to a virtual audience member providing the final answer).

7.6. Study Three: Story Objects

Study Three explored the effectiveness of using story objects to allow users to trigger narratives in the prototype. This study had one independent variable, *Story Objects (SO)*, with three conditions which were compared in 3x1 between-subjects design:

1. *Predetermined Narratives* (*P):* no story objects
2. *Predetermined Narratives and Story Objects* (*PO):* the first two narratives followed a predetermined order; the remaining three narratives were triggered via story objects.
3. *Story Objects* (*O):* all five narratives were accessed via story objects.

We used general linear models to test the effect of *SO* on *Int*, *Enj*, *Eng* and *SR* while controlling for *EK*, *IT*, current year of study, faculty, age, gender, nationality, hometown, race and whether participants had visited the District Six Museum or studies District Six at school.

Interest:

The linear model for *Int (F* = 22.59, R^2 = 0.51*, p* < 0.001) had two predictors: *IT* and *SO.* Only *IT* was a significant predictor (see Table 7.19) and the positive regression coefficient indicated that higher *IT* predicted higher *Int* (*t* = 8.18).

Int predictor	***F value***	***p***
SO	0.43	0.66
IT	***66.92***	***< 0.001***

Table 7.19 A summary of the predictors in the linear model for Interest (*Int*) (F = 22.59, R^2 = 0.51, *p* < 0.001) in Study Three. Interest Tendency (*IT*), shown in bold and italics, was a significant predictor while Story Objects (*SO*) was not.

Enjoyment:

Enj's linear model *(F* = 2.78, R^2 = 0.27*, p* = 0.02) consisted of *SO*, *IT*, age and current year of study (see Table 7.20). Of these, *IT* was a significant predictor with a positive relationship with *Enj* (*t* = 10.50).

Enj predictor	***F value***	***p***
SO	1.29	0.29
IT	***10.50***	***0.002***
Age	2.24	0.14
Study Year	1.38	0.26

Table 7.20 A summary of the predictors in the linear model for Enjoyment (*Enj*) (F = 2.78, R^2 = 0.27, *p* = 0.02) in Study Three. This model considered the influence of Story Objects (*SO*), Interest Tendency (*IT*), age and current year of study on *Enj*. *IT*, shown in bold and italics was the only significant predictor.

Engagement:

The *Eng* linear model was borderline significant ($F = 2.69$, $R^2 = 0.11$, $p = 0.05$). As shown in Table 7.21, *SO* was a non-significant predictor, while *IT* was a significant predictor. Additionally, high *IT* scores predicted high *Eng* scores ($t = 4.88$).

Eng predictor	***F value***	***p***
SO	1.60	0.21
IT	***4.88***	***0.03***

Table 7.21 A summary of the predictors in the linear model for Engagement (*Eng*) (F = 2.69, R2 = 0.11, *p* = 0.05) in Study Three. Interest Tendency (*IT*), shown in bold and italics, was a significant predictor while Story Objects (*SO*) was not.

Storytelling Realism:

*W*e are unable to build a significant linear model for *SR*.

7.7. Qualitative Feedback

Participants' qualitative feedback on the prototype was generally positive, but also provided constructive criticism of its shortcomings. In the following two sections we will describe participants' responses where the questionnaire asked them to note their favourite narratives and storytellers, the things they liked and disliked about the prototype and general comments.

7.7.1. Favourite Narratives and Storytellers

We asked participants to identify their favourite story and storyteller, along with reasons. In experimental conditions containing questions and/or exchange structures, some narratives were more interactive than others. In asking participants to pick out favourite stories and storytellers, we were interested in seeing whether, firstly, they preferred the more interactive stories and, secondly, what, apart from interactivity, made particular stories and storyteller stand out. What we found was that most participants chose favourites based on narrative content, tone and style, rather than amount of interactivity. Only six participants indicated preferences, for the Noor agent, based on interactivity saying that the Noor agent answered more questions, was interactive, communicated personally and asked a lot of questions (i.e. exchange structures). One participant preferred Noor because he "created more of a relationship with his audience".

For favourite narratives, 51 participants chose the story about Noor's family home, 34 chose Noor's narrative about the Group Areas and Mixed Marriages Acts, 7 chose Joe's Richmond Street narratives and 8 each chose Joe's Bloemhof Flats and public signs narratives. Forty-one participants either chose more than one favourite or no favourite. A number of participants expressed difficulty at choosing the story or storyteller they *enjoyed* the most, because the stories were not "enjoyable" per say, but hard to hear:

> *"I would not say enjoy because it was actually sad. It's real."* (in reference to choosing a favourite story)

> *"I found them equally interesting. "Enjoy" is perhaps not the right word – I found them to be equally informative and relevant… Necessary to hear."* (in reference to choosing a favourite storyteller)

Ninety-nine participants preferred the Noor agent and 34 preferred the Joe agent. Eight liked both equally with a few reporting that they complemented each other. Interestingly, a number of participants referred to the storyteller agents as characters and seemed not to realise that they were based on real people. One participant stated that the "the *characters* were relatable" while another said that the storytellers' way of speaking made the characters believable. We had thought the contextualisation material provided before the storytelling VE was (see Section 7.2.2) would make it clear that Joe and Noor were real people, but this may not have been clear.

Overall, there was a clear preference for Noor's narratives with many participants preferring their "personal", "emotional" content with lots of specific details (such as years). Although this kind of content was present in both storytellers' narratives, it was more abundant in Noor's. Many participants appreciated hearing about his family history and his neighbour's story of being separated from his family:

> *"Noor, his stories were more personal and less general. He told about specific people, like the coloured guy who was married to the black lady."*

> *"… Noor pointed out his actual feelings, experiences he had e.g. when he watched his house being brought down, after 4 generations living in that house."*

Meanwhile, a smaller number preferred the less personal, more "factual" content which characterised Joe's narratives:

> *"… he gave facts about what happened and how it happened rather than talking about his family."*

> *"… he was more factual and less sentimental … I find it easier to process the straight-forward information."*

Some chose "sad" stories as favourites while others were more inclined towards the stories they found less "bitter" and "more optimistic". Many favoured narratives which presented information that was new to participants, particularly in the case the Groups Areas and Mixed Marriages Acts narrative. At the District Six Museum, we routinely observed this story surprise visitors as the content is shocking if one has never heard of the Mixed Marriages Act or how it was enforced. Two participants, who selected this as their "favourite", said:

> *"… I've never heard such a horrible story that really illustrates how people were affected by Apartheid."*

> *"… I feel like that story made the removals real for me; it shed light on the effects these removals had on families; it stepped down from community-based effects to a narrower, yet essential, aspect of life, and that is family."*

In a similar vein, a number mentioned specific content that stood out to them, such as how races were segregated, what District Six was like before forced removals. For example:

> *"I enjoyed the story about Richmond Street the most … I have always wondered about the empty land there … what it used to be like."*

Others noted storytellers and content that resonated with them personally. Two participants preferred Noor's stories on the basis of having similar cultural backgrounds and family histories. One older participant said that the Mixed Marriages Act story echoed her own family history of having to live apart from her father. Similarly, some participants related more to Joe, with two singling out his Bloemhof Flats story as relating to their own pasts of living in townships. Many participants chose favourite storytellers because of their tone and speaking styles. Among the descriptors noted here were "humour", "well-explained narratives", "heartfelt" and "calm". Some liked their accents, which they found to be distinctively Capetonian. A few participants enjoyed the Joe agent's use of Afrikaans slang, word play and cocky tone. A handful found Noor's tone condescending saying that it seemed like he was talking to children. This makes sense, since Noor's voice audio was recorded during tours with younger school groups at the museum. A number mentioned the off-the-cuff, unrehearsed sound of the storytelling, which resulted from the fact that both storytellers were recorded during tours at the museum.

7.7.2. Likes, Dislikes and Comments

We asked participants to note their overall likes and dislikes, and provided a section for general comments, and, in general, comments tended to echo and expand on the likes and dislikes. Most participants identified up to four or five things they liked and one or two things they disliked. Many responses arose repeatedly, so, to have a useful picture of these, we identified the main themes in participants' responses which we describe next.

Overall Impressions:

Many general comments focused on the prototype as a whole with many participants reporting that they had a positive experience. A number enjoyed the narratives themselves and the experiencing them in a VE:

> *"Wow this was amazing, this is one way of sharing and preserving history, it's much more recent in terms of technology and makes history fun and easy to follow… I really enjoyed the storytelling. Hope other people get a chance to watch and learn about our history. I also loved the interaction between the user and the PC/storyteller…"*

> *"The storytelling environment was really something different. It was the coolest thing I've ever seeing, making a programme about people telling stories, I was amused by this. This experience was really cool. I enjoy it…"*

A handful of participants said that the digital storytelling was preferable to reading books about District Six. One even suggested that it could substitute for visiting a museum:

> *"…great potential in teaching people about our history without actually having to read a book, or go to a museum."*

On the same note, two participants compared the prototype to the District Six Museum, saying that it gave them a similar experience or would have enhanced their visit:

> *"The experience I had at the actual museum in terms of knowledge and information gathering was the same as the 3D Game/virtual thing … It was very effective."*

> *"… would have been delighted to see this at the museum which I found a bit boring and in need of interactive tools like this where you can hear real stories…"*

Quite a few participants wanted to experience the VE again. As mentioned earlier (in Section 7.1), many inquired about its future availability and expressed interest in finding out more about the projects by either by approaching the experimenter after their session or by asking, in their comments, to be kept informed:

> *"I really enjoyed this storytelling... Please keep me posted. My student number is … I will be so GLAD."*

Most negative comments addressed the poor quality of the graphics and audio. We will describe these in more detail later.

Narrative Content:
Twenty-four participants picked out the narratives themselves as a "like", citing similar reasons to those discussed in the previous section, such the personal content, humour and novel information. The majority of general comments addressed the participant's impressions of the narrative content. Nine participants said they *disliked* narratives because they were "painful", "sad", or frustrating to hear. Four participants felt that the stories were limited as they only gave two people's perspectives and only told about Cape Town's forced removals while a few others would have liked some female perspectives on forced removals. In the general comments, many said that the stories were entertaining, interesting, sad and captivating. Many also said they learned new information about District Six and/or forced removals:

> *"The storytelling I experienced was more captivating and fun than all the other stories I heard before about the forced removals and it made me aware of the place (District Six) before I didn't actually know about the place."*

> *"…I thought the Group Areas act only affected black people the most, but now I know it affected everyone of colour."*

Other participants said the stories made them grateful for the state of present-day post-Apartheid society:

> *"I really enjoyed listening to the stories told by people who actually EXPERIENCED the hardships brought on by Apartheid! It made me realize how much I appreciate our country's strong heritage and historical background."*

"… I was reminded of how often we take history for granted… I am empowered when I realise just how far we all have come."

As we found when people chose their favourite stories, some of the comments revealed that some participants related to some narratives on a personal level:

"… I could relate to it because I have family whom experienced the separation and I live in the Cape Flats area because of that separation."

The Virtual Space, Controls and Presence:
Thirty-five participants liked the fact that the storytelling took place in a VE with some singling out specific aspects of the virtual space, such as the textures, ambient noise and simple layout. Some said that the space felt, relaxed, "homey" and they felt like they were visiting a museum. Four participants found that the space's simplicity made it easy to focus on the storytelling. In contrast though, there were 28 participants who disliked aspects of the VE: Nine found it too sparse and a few others described it as gloomy, dull and cold. Six participants did not like the fact that the room was closed with no windows to an "outside" and with "nowhere to roam". Nineteen participants enjoyed navigating the VE while a smaller group (10) found the navigation controls unintuitive and did not allow close enough viewing of the pictures. Two participants found the mouse movement too sensitive. Overall participants did not address the typing controls but a two disliked that misspellings in their input were not automatically corrected.

Seven participants reported that the VE felt like a real place. Presence the term commonly used to describe the phenomenon where a VE feels like a real place and users experience the feeling of "being there" or being present in it (Lombard & Ditton, 1997; IJsselsteijn, et al., 2000). Some participants' comments strongly suggested that they experienced some kind of presence in the VE. For instance, some said that the VE felt like a real museum, they "felt part of it", "it was just as if you're there" and, even, that they "felt present". One participant even felt a social obligation to pay attention to the storytellers as though the scenario were real:

"I found it interesting that I sat down and faced the speakers and felt bad when I ran around the room."

Storyteller agents:
Twenty-four participants liked the storyteller agents, their perceived personalities and the "way they told the stories":

"I liked the personalities of the storytellers and how their presence made the stories life-like rather than an assault of information, which limits the connection you feel with the individuals who lived through that time."

Numerous participants enjoyed specific attributes of the storytellers including their voices, dress, gestures and animations. A handful, however, disliked things about the storytellers' 'manner'. One felt that the storytellers treated them as though they were a child; another noted that Joe did not

know their gender since he used the wording "yes sir" when acknowledging their questions. Strangely, five participants did not like the fact that the Joe agent stood while Noor sat. While we did this because, at the museum, Joe usually stands and Noor often sits during tours, this seemed strange, unfair even, to this group.

Questions and Exchange Structures:
Questions received numerous positive and negative reviews. Nineteen participants liked having the ability to ask questions. One said they liked being able to ask questions "at any time" while another said that they liked the question hints. Our usage logs showed that a large proportion of user's questions were not successfully answered (see Section 7.5.2 above). This was reflected in participants' feedback with 21 listing questions as a "dislike" and 5 specifically disliking the storyteller agents' repeatedly responding "I don't know" to questions. The storyteller's limited question-answering abilities also featured prominently in the comments. Others noted that, when they did get answers, they were often irrelevant or unsatisfactory. Four participants picked up on the fact that the storyteller agents could answer a limited repertoire of questions. One said they disliked "having to ask certain questions", another "couldn't guess the right questions" to ask and another said that asking questions was difficult as they "didn't know what the computer could answer". This was contrary to our aim of creating the impression that users could ask any question they wanted:

> *"The answers the tellers were able to give were very limited. The whole experience left me with a whole lot of questions which the tellers were not able to answer."*

> *"Some of the questions I asked did not get any replies from the story tellers. Had to look for what they wanted to be asked rather than asking my own question."*

The following participant reported that unsuccessfully answered questions curbed their desire to keeping asking questions:

> *"…Very few of my questions got answered … so I stopped asking as frequently, although just listening was interesting…"*

A few participants were especially surprised that the storytellers could not answer questions about themselves. Looking at the questions participants entered in the usage logs showed that many asked questions about Joe and Noor themselves - a particularly common question asked where they moved to after leaving District Six. This is positive because it suggests that people wanted to know more about the storytellers. But, unfortunately, the storyteller agents were not able to answer many of these questions; this was most likely unexpected, for instance:

> *"Joe responded with 'I don't know' when I asked where he moved to."*

Many participants made suggestions for improving the question system including increasing the agents' question repertoires and improving the hints by, for example, using hint phrases or expanding the hints into full questions:

"…could be improved maybe by having a big repertoire of questions. More meaningful hints"

"…I think a list of possible questions would aid question asking."

In one case, we observed a participant who was such a fast typist that they never saw the question hints displayed (since hints only appeared after a number of seconds). This participant suggested that there should be hints to help with asking questions. Another participant commented that the hints were helpful and, indeed, we observed a number of participants input questions more successfully after seeing hints. Although some took this to the extent of inputting only the keywords, rather than fully-formed questions, in order to get responses.

Of the 95 participants who experienced exchange structures, 15 identified them as something they liked, with one participant describing the interaction as realistic. Furthermore, comments suggested that some participants enjoyed the exchange structures, while others did not. The following participant found them frustrating and made a number of useful observations, namely that it was easy to miss the initiating question and that misspellings were not well handled. Nonetheless they suggest that the exchange structures kept them engaged:

"… Some questions were sudden and unexpected. It was sometimes hard to hear what was asked and I couldn't repeat the question … With respect to the question about the black settlements, I knew the answer but had trouble spelling the names. That being said the questions kept me alert."

Pictures:
The pictures objects got the most mentions (71) as a "like". Most, however, did not specify whether they were referring to the non-interactive or the story object pictures. But many participants definitely enjoyed the inclusion of pictures related to the narratives:

"… the way it was told and elaborated by the pictures it made it all clear … what exactly happen(ed) in this area."

Thirteen participants especially liked the Richmond street panel which swivelled to show a before and after view. Five participants disliked some aspects of pictures such as not being able to see some details in the smaller photographs. A further five wanted more pictures, for instance, of where District Six residents were relocated to and of present-day District Six.
Story objects:
Twenty-one participants enjoyed selecting the story objects and, again, the Richmond Street panel was especially popular:

"… I also loved the interaction with the pictures, particularly the one of Richmond Street; that really stuck with me."

A number of *PO* condition participants liked the sequencing of the stories, with the first two narratives occurring in a predetermined order and the subsequent three activated via story objects.

The Virtual Audience:
Fifteen participants liked the virtual audience, meanwhile, 15 disliked them. In the latter case participants complaints included: they were too spaced out; there were too few of them; they were too static; and they did not like that they were sitting on the floor. Five participants noted, and disliked, that the audience members were all identical looking and, furthermore, white! They felt, given that the VE dealt with racial segregation, this was not appropriate. A few participants also disliked that the audience was not animated when interacting with the storyteller agents. They noticed that the audience's hands did not go up before they asked questions, for instance.

Eighteen participants enjoyed observing interactions occur between the storyteller agents and virtual audience. Interestingly, 13 of these were participants in the conditions with questions, or exchange structures, or both turned off. Recall that where questions and exchange structures were turned off, non-interactive versions were included so that all participants heard the same content. Hence, participants in conditions with one or neither of these interactions activated, therefore, heard questions and/or exchange structures taking place between the storytellers and virtual audience. It is possible that participants who liked hearing these interactions would have liked to partake in them, as opposed to being passive observers. Two participants in Study Two's condition without questions or exchange structures said that the VE's interactivity boosted engagement with the stories, despite the fact that they did not partake in the interactions. One said it "forced attention" on the storytelling and the other said:

> *"The interaction of the (other) listeners with the speakers, it kept my interest high as I had similar questions or wanted to hear opinions."*

Audio:
Since the prototype stitched together recordings from a variety of Joe and Noor's tours, there were variations in the audio quality and volume. While this was raised in our small pilot trial, we thought that this would not be major issue. However, numerous comments mentioned this and the most number of "dislikes", 36, addressed audio quality, with 27 participants mentioning the volume fluctuations:

> *"The sound quality was off-putting at times, it would alternate between loud and soft."*

> *"The sound sometimes jumped, which hampered the dialog feel to the story."*

Additionally four participants said that the questions asked by the virtual audience members were inaudible. When we recorded the tours, our intention was to record the storytellers, not the audience members (hence the use of a lapel microphone). As a result, audio of audience members' voices was faint in comparison with Joe and Noor's voices.

Graphics and Models:
Twenty-seven participants found the VE's "graphics" quality poor most often citing the quality of the avatar models. Five participants felt the avatars didn't look realistic, others pointed out that none had lip movement or individual fingers. Nine participants criticised the animations, describing them as "too basic" and "jerky".

7.8. Summary

Here we summarise our main results:

1. *Our story experience questionnaire was psychometrically sound and the dependent variables correlated as predicted by our conceptualisation of story experience* – validity and reliability testing allowed us to identify questionnaire items that detracted from soundness should be removed. Ultimately, our questionnaire consisted of scales to measure control variables, *EK* (participant's existing knowledge of District Six and forced removals) and *IT* (the tendency to show interest in South African history and personal experience narratives), and the dependent variables: *Int* (interest in learning more about the narratives' context), *Enj* (enjoyment), *Eng* (amount of engagement experienced) and *SR* (how much the virtual storytelling felt like real-life storytelling). The dependent variables, which all relate to dimensions of story experience, all correlated positively with each other indicating a significant relationship between them. Additionally, *IT* correlated positively with all the dependent variables showing a significant relationship with story experience. *EK*, however, did not correlate with any aspect of story experience. The importance of *IT* in relation to story experience became apparent when testing the effect of our experimental manipulations on story experience; *IT* consistently proved to be a significant predictor of dependent variables.

Regarding the effect of interactive questions and exchange structures on story experience:

2. *Questions significantly improved some aspects story experience, namely interest and engagement* – this was shown in the linear models for *Int* and *Eng* where the inclusion of questions (*Que*) proved to be significant predictor. Furthermore, the positive regression coefficients in these models and means plots indicated a positive relationship such that including questions led to greater interest and engagement.

3. *Exchange structures significantly improved almost all aspects story experience including interest, enjoyment, and engagement* – using the linear models we found that the inclusion of exchange structures (*ES*) was a significant predictor for *Int*, *Enj* and *Eng*. Furthermore, positive regression coefficients and means plots showed that exchange structures significantly increased levels of interest, enjoyment and engagement.

4. *There were no interaction effects between questions and exchange structures*.

We further analysed usage logs to gain additional insight on how participants interacted with the storyteller agents during questions and exchange structures. We also noted participant's qualitative feedback regarding these interactions:

5. *Participants engaged positively with the question interactions* – they input a mean of 10 questions, almost never opted out of entering a question (mean = 0.32) and did not typically

allow question opportunities to timeout (mean = 3). Usage logs also showed little difference in the number of questions input during narratives and during question opportunities (where the storyteller agents invited the user and virtual audience to ask questions).

6. *The prototype was unable to recognise a large proportion on user's questions* –on average, 65% of the questions entered by participants were unrecognised. This would have resulted in the storyteller agents replying "I don't know" rather than answering these questions.

7. *Keyword hints for questions helped participants input questions that the storyteller agents could answer, but also allowed participants to realise that the storyteller agents could only answer a limited repertoire of questions* – we observed many participants successfully input questions the storyteller agents could answer after seeing the question hints. Some commented that the hints were helpful in this regard. Others pointed out that it was clear that the storyteller agents could only answer a limited set of questions and they were, in fact, not able to input any question they wanted.

8. *Qualitative feedback indicated that a small number of participants enjoyed questions, but, in general, certain design flaws detracted their effectiveness* – A small number of participants stated that they liked the question interactions and the ability to ask questions at any time. But, 21 out of the 94 participants who experienced them, identified questions as something they disliked. Numerous comments stated that the storyteller agents' inability to answer their questions was frustrating. Some stated that the realization that the storyteller agents could only answer a limited set of questions detracted from their experience. Many participants made suggestions for improving questions.

9. *Participants interacted readily with the exchange structures* – usage logs showed that, on average, participants entered twelve inputs spread over the seven exchange structures. There were few or no (mean = 3) instances of opting out (by pressing Escape). On average, participants input the correct, or terminating, answer for four of the exchange structures.

10. *Fifty-five percent of participants' exchange structure inputs were not recognised by the storyteller agents* – and, while observing participants use exchange structures we noticed some unexpected patterns of input that the prototype would not have been able to parse.

11. *Exchange structures did not feature prominently in participant's qualitative feedback. But, there was both positive feedback and useful suggestions for improvements* – a small proportion (15%) of participants who experienced exchange structures singled out them as something they liked. General comments indicated that some participants enjoyed. Others said they did not always hear the initiating question or know the correct answer(s) or know how to spell correct answer(s), thus making it difficult to partake in the exchange structure.

12. *Unexpectedly, some participants enjoyed passively observing interactions between the storyteller agents and virtual audience* – this was reported by only 18 participants, but 13 of these were in non-interactive conditions where they would have been passive observers to these interactions. Their comments suggested that observing interaction between storyteller

and audience avatars encouraged engagement, or attention, on the narratives and allowed them to hear answers to questions they would have liked to have asked.

Regarding the effect of story objects on story experience:

13. *Story objects did not affect story experience* – the use of story objects (*SO*) to trigger narratives did not affect any aspect of story experience significantly. A relatively small proportion (21) of participants mentioned the story objects positively in their qualitative feedback. A number of participants particularly enjoyed the scripted movement of the Richmond Street panel.

Regarding participant's overall response to the storytelling prototype:

14. *Overall, participants responded very positively to the prototype and narratives* – we observed numerous indicators during the experiments that the prototype was received positively and left a lasting impression. Most participants appeared highly engaged while using the prototype, exhibiting behaviours such as giggling and gasping. We also observed participants who appeared bored, but this was far less frequent. Many participants approached the experimenter to compliment the prototype and to find out about its future availability. Combined data from Studies Two and Three showed that story experience scores were very high, so much so *Int*, *Enj*, *Eng* and *SR* were all non-normally distributed with scores clustered around the scales' higher values. Much of the qualitative feedback was enthusiastically in favour of the concept of storytelling in VR. Some liked the virtual space's look and feel, enjoyed navigating the space and the fact that is felt like a real place. Many (71) singled out the pictures objects as especially favourable. A handful indicated that a storytelling VE was preferable to reading similar narratives or, even, visiting a museum (an unintended outcome!). Others, who had visited the District Six Museum itself, suggested that the prototype would have enhanced their visit. The majority of focused on the impression left by the narratives themselves saying that they were "entertaining", "interesting", "captivating" and "sad". Many stated that it was the first time they heard stories about District Six and, hence, found them enlightening. For others, the narratives made them grateful that Apartheid was ended.

15. *Most participants preferred real-life, personal narratives, as opposed to non-narrative information* – Ninety-nine (70%) of participants indicated that the Noor agent was their favourite (compared to the 24% who selected Joe and the 6% who chose both as favourites). Only 6 indicated that this preference was because that agent was more interactive, whilst 92 said it was because his narratives were real-life, personal narratives. Many also indicated preferences for narratives that included humour or were more emotional. A minority preferred the Joe's narratives because they were less personal and conveyed "factual" information about Apartheid. Some based preferences on accents and speaking style. For example, some found the Noor agent's tone (recorded during tours with young school students) condescending while others enjoyed the Joe agent's use of Afrikaans slang. Some participants chose favourite narratives and storytellers because of their personal resonance,

e.g. narratives from which they learned something new, topics they found interesting while or resonance with their own backgrounds.

16. *A number of participants did not "enjoy" the narratives, but were engaged* – the wording in our questionnaire asked participants to identify the storyteller and narratives they most enjoyed. A number of participants stated that *enjoyment* was not an accurate descriptor since the narratives were sad. But, they found the narratives "interesting", "informative", "relevant" and "necessary to hear". In the general comments, a handful of participants explicitly stated that they *disliked* the narratives since they were "painful".

17. *Most reported dislikes and negative comments focused on the prototype's aesthetics and audio quality* – 27 participants found the graphics quality poor and particularly criticised the quality of the storyteller and audience avatar models and their animations (both of which featured very simple geometry). Fifteen participants disliked the virtual audience for a variety of reasons including their positioning in the virtual space, lack of animations and the fact that they were all identical. While more participants liked the virtual space, a large group (28) found it too sparse, and did not like the fact that it was a closed space with nowhere to roam or no windows. Another predominant criticism (raised by 36 participants) related the soundtrack's audio quality and volume fluctuations which resulted from using recordings from a variety of real museum tours. A small group (10) disliked aspects of the navigation controls.

In the next chapter we describe how we used some of the lessons learned from Studies Two and Three to improve the prototype before conducting Study Four, where we deployed and evaluated the prototype at the District Six Museum itself.

Chapter 8

Study Four: Digital Storytelling at the Museum

This chapter describes this projects' final study in which we used the major lessons learned from Studies Two and Three to make improvements to the prototype and, then, deployed it as an exhibit at the District Six Museum. The initial motivation for this project, as a whole, was to collaborate with the museum to explore interactive, long-term ways to present the stories of District Six ex-resident's stories. We hoped this exploration would produce a design for interactive digital storytelling which the museum could build upon to preserve ex-resident's storytelling. Thus, in the final phase of this project, sought to answer the following research question:

Is an interactive digital storytelling system effective for engaging museum visitors?

Given the overall positive response of participants in Studies Two and Three to the prototype, we hypothesised that the prototype would be similarly successful with museum visitors. We were additionally interested in exploring usage patterns among voluntary users in a public setting. We begin by describing how we modified the prototype (Section 8.1). Next, in Section 8.2, we describe Study Four – the exhibit, procedure and measures used, while Section 8.3 presents results. In Section 8.4 we describe the conclusion of our collaboration with the District Six Museum in which we presented Study Four's initial findings and discussed the future of the prototype. Section 8.5 summarises Study Four's main outcomes.

8.1. Prototype Changes

Before deploying the prototype at the museum, we used results from Studies Two and Three to improve it. We attempted to address two major areas: the storyteller agents' inability to answer a large proportion (65%) of user's questions (see Chapter 7, Section 7.3.2); and the soundtrack's audio quality (see Chapter 7, Section 7.7.2). Other areas needed improvement too, such as the virtual audience models and animations. But, we focused on what Studies Two and Three had revealed, statistically and qualitatively, as the prototype's greatest shortcomings.

8.1.1. Question Improvements

We increased each storytelling agent's repertoire of questions. However, this required gathering new recordings of Joe and Noor answering the questions we wanted to add. We consulted the usage logs from Studies Two and Three, noting all the distinct questions that were not recognised or appropriately answered. This amounted to 147 questions for Noor and 114 for Joe. Due to time constraints, we could not add all these questions for Study Four. So, we added those asked most frequently in Studies Two and Three's. But, in the interests of upgrading the prototype beyond Study

Four, we recorded Joe and Noor answering all 261 questions. Previously, the Noor agent was able to answer six questions. Four were tied to the Mixed Marriages Act narratives and two to the narrative about his family home. The Joe agent was only able to answer three questions; one related to the Bloemhof Flats narrative and two to the Richmond Street narrative. We chose to upgrade both agents to a question repertoire of fifteen questions; these can be found in Appendix E, Section E.1.

Adding these questions led us to realise that in our implementation the storyteller agents' question repertoires comprised of the questions associated with their question opportunities which were, in turn, narrative-specific. Hence, all the questions were related directly to one of the narratives. But, Study Two and Three's participants often asked about the storytellers themselves or about Apartheid in general. For example, "Where did you moved to?" was the most-asked question and neither storyteller agent was able to answer it. From the user perspective, the storytellers not being able to answer basic, personal questions, almost certainly broke the illusion of listening to a real storyteller. So, instead of only increasing the question repertoires associated with question opportunities, we also changed our implementation to better handle questions related to the storytellers themselves and general questions about District Six, forced removals and Apartheid. We did this by adding a collection of *question responses* to each storyteller agent, which was independent of any of their narratives. Where needed, we also added narrative-specific question responses to individual narratives. We defined these in the storyteller agent and narrative content configuration files between labels *"begin question responses"* and *"end question responses"* (see Appendix C, Sections C.2 and C.3, respectively). Like the question opportunity questions, these question responses consisted of keywords and audio of Joe or Noor answering the question, but no audio of audiences asking those questions[17]. Hence, questions responses would never be heard as a question from the virtual audience; they were only to be played in response to user's input. With this change, when a user inputs a question during a narrative, the prototype first searches for a matching response in the narrative's question response collection, then in the narrative's question opportunity, if there is one. If no match is found, the storyteller agent's question response collection is searched. If still no match is found, is searches other narratives' questions which were not narrative-specific. When a user inputs a question during a question opportunity, almost the same search order was followed except that the prototype would first search the current question opportunity a match. Recording the new question responses gave us an opportunity to gather other useful audio. For the first version we trawled through Study One's tour recordings for the audio used. While we were able to find and edit most of the audio needed, we did not have enough variety to make some audio seem completely natural. For example, we were only able to find one recording each of Joe and Noor saying "I don't know" and had to use this same recording each time the prototype did not recognise user questions. So, for both Joe and Noor we recorded additional audio to add more variety to the storyteller agents' audio when acknowledging questions, inviting questions and responding to unrecognised questions and exchange structure inputs. A final change made to improve the storyteller agent's recognition of user input was to add more possible misspellings to our content configuration files so that they could better recognise misspelt user inputs. Once more, we reviewed Study Two and Three's usage logs to help us see which misspellings arose often.

[17] Recall that, in question opportunities, the audience audio would be played for where the virtual audience members occasionally asked questions.

8.1.2. Soundtrack Improvements

Since the soundtrack was composed of multiple tour recordings pieced together, there was a lot of audio quality variation, particularly the volume levels. We fixed the volume fluctuations by normalising the volume of all the audio and removing ambient noise where necessary. Where possible, we increased the volume of audience member's voices during questions and exchange structures. We were not able to eliminate all the quality variations, but the soundtrack was more consistent and all the audio was equally audible. Ideally, future work on the prototype would benefit from higher quality rerecording of Joe and Noor during tours.

8.2. Study Description

Study Four's purpose was to explore how digital storytelling might fit in at the museum by introducing our prototype as an exhibit. We wanted to observe how museum visitors responded to and used the prototype, especially with minimal training. Secondly, we wanted to see how interactive digital storytelling fit in at the District Six Museum, whose permanent exhibits do not include any interactive technology. Hutchinson et al. (2003) describe "technology probes": simple, flexible technologies deployed in real-world settings with the intention of understanding users in that setting and how they might respond to new technologies, inspiring dialogue about novel designs and field testing a technology. Study Four aimed to observe the introduction of interactive digital storytelling to the museum and field test our prototype. However, technology probes are also typically open-ended tools with little functionality intended to inspire new designs. They are also typically employed early on in the design a new technology, whereas our museum deployment was the final phase of our overall project. So, while Study Four was exploratory in its aim to understand the museum setting in relation to digital storytelling, this was a secondary aim. Primarily, we were field testing the prototype whose design was ethnographically inspired and refined via collaboration with the museum and empirical testing. We prepared one version of the storytelling prototype which included questions and exchange structures. Furthermore, in this version the order of the first two narratives was predetermined and the remaining three narratives could be triggered by clicking on story objects (equivalent to Study Three's *PO* condition).

8.2.1. Storytelling Exhibit

We created our exhibit in consultation with the museum's curators. An initial challenge was finding a space where the prototype would neither physically, or thematically, encroach on other exhibits. The curators suggested a space in the main hall among the hanging banners. This location, shown in Figure 8.1, was in the open where many visitors would pass by, but was secluded enough that visitors engaging with the exhibit would not be disturbed by others walking around the museum. The setup, shown in Figure 8.2, consisted of a wooden table and chair, similar to the rest of the museum's furniture. The prototype ran on a high performance laptop connected to a 17-inch LCD screen, keyboard, mouse and headphones. In Studies Two and Three, we recruited paid volunteers to participant and were able to provide them with training for navigating the VE, interacting with the storyteller agents and use story objects. However, here we wanted to observe incidental and independent use of the prototype. Hence, we did not recruit visitors to try the prototype. Instead, we set up the exhibit with a sign, to inform visitors of the temporary exhibit, which read: ***Digital Storytelling Exhibit:*** *We are trying out a new interactive exhibit. Sit down, try it out and let us know what you think.*

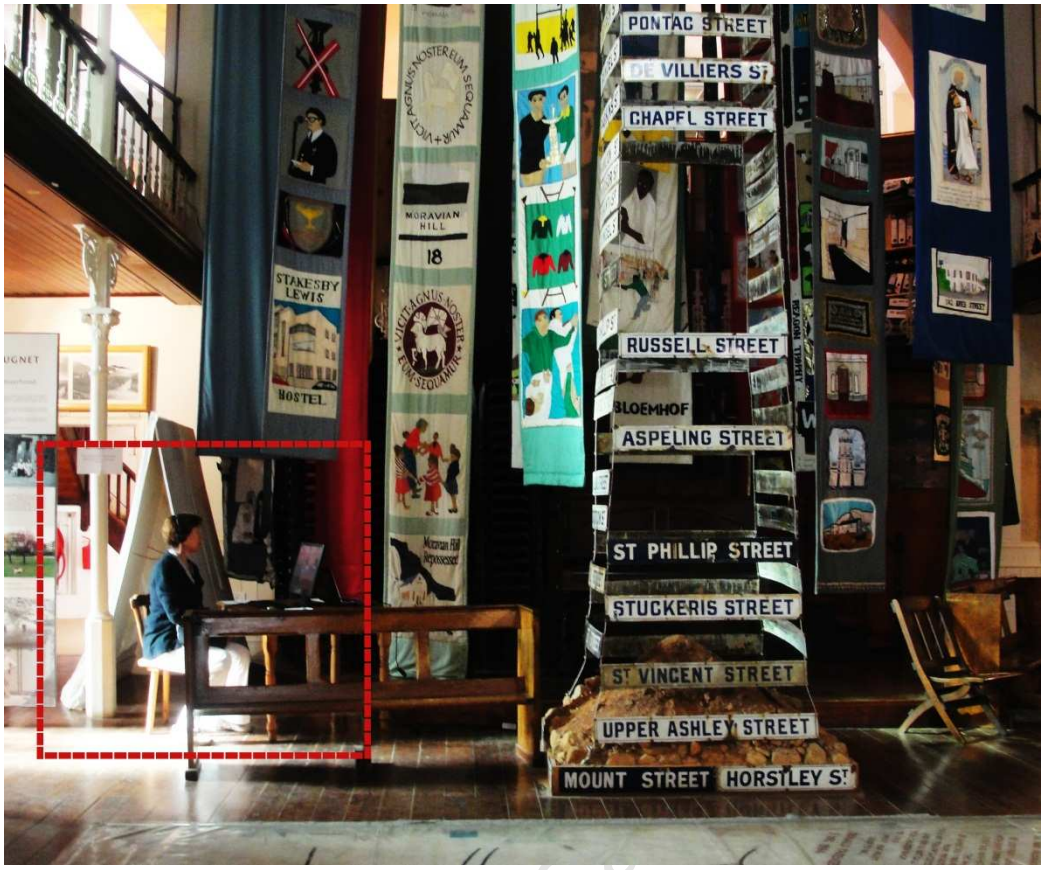


Figure 8.1The square outline in this photograph shows where we set up our exhibit, on the bottom floor of the District Six Museum's main hall. We collaborated with curators to find a space where setting up the prototype would not interfere with the other exhibits. Additionally, this space allowed the exhibit to be seen by many visitors and was secluded enough that visitors at the exhibit would not be easily disturbed.

Figure 8.2 The exhibit setup. The prototype ran on a high performance laptop connected to a 17 inch LCD monitor accompanied by a keyboard, mouse and headphones (left). We attached a page summarising the prototype controls to the table and left a number of feedback forms and a pen on the table for visitors to complete after their experience. A sign, shown in the square outline on the right, drew attention to the exhibit.

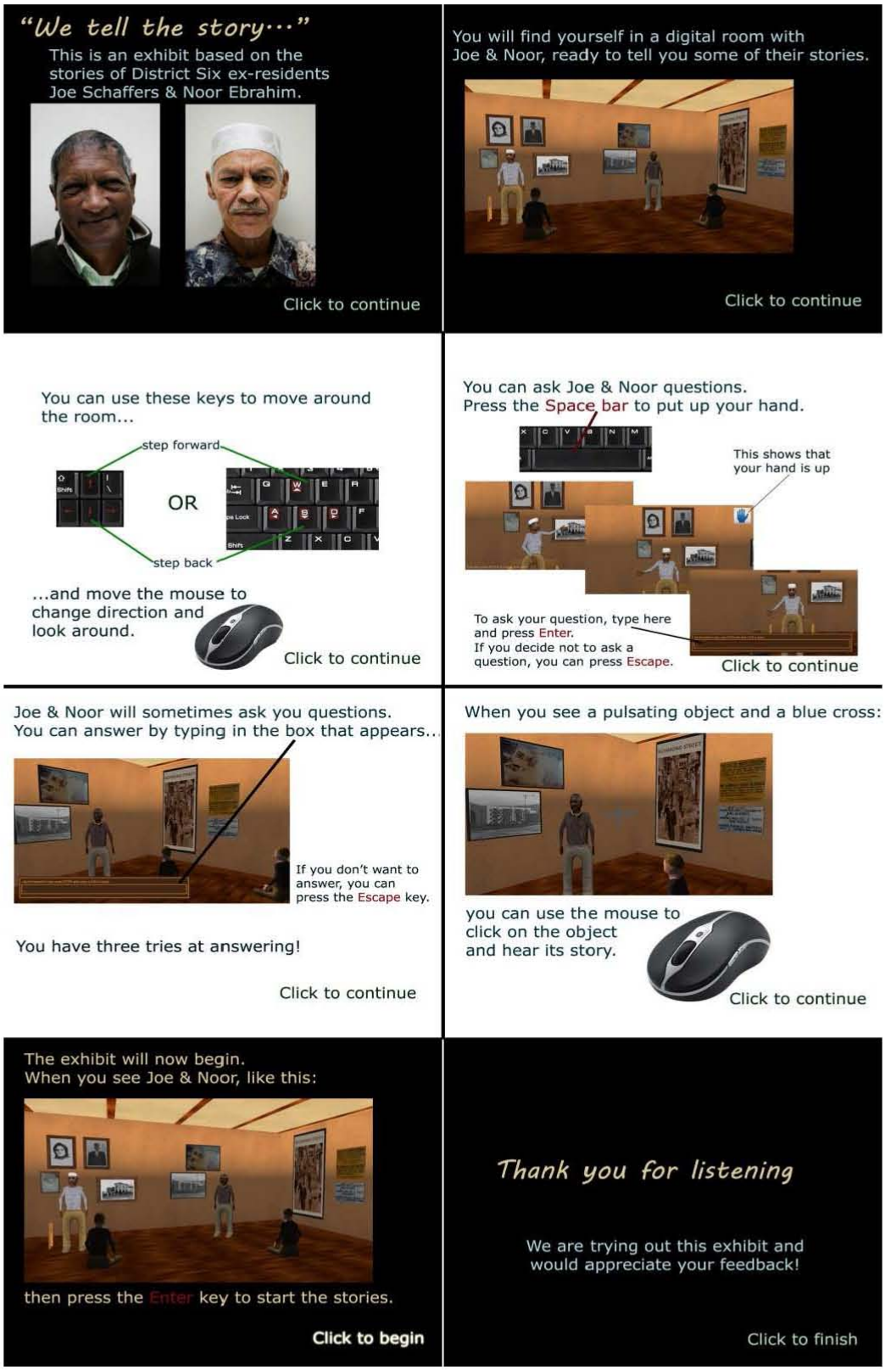


Figure 8.3 Slides used to provide museum visitors with context and training information for the storytelling exhibit. The slides could be advanced by clicking the mouse anywhere on the screen. The first seven slides, starting at the top, were shown before the storytelling VE was loaded. The first two (top left and right) provided context about Joe, Noor and the prototype. The third (second row, left) explained the navigational controls. The fourth (second row, right) and fifth (third row, left) slides explained questions and exchange structures, respectively. The sixth (third row, right) described story objects. The seventh slide (bottom left) prepared visitors for what they would see when the VE loaded and explained that they could press Enter to begin the VE. The final slide (bottom right) was shown after the storytelling VE was complete and encouraged visitors to complete a feedback form.

To provide context and training information, the prototype was preceded by seven slides, displayed on the screen. These are shown in Figure 8.3 above. Visitors could read the slides at their own pace and advance to the next slide by clicking anywhere on the screen. Once all seven slides had been read, the prototype loaded automatically. Once the prototype exited, a final slide thanked visitors and encouraged them to complete a feedback form. When they clicked on this slide, the first seven slides were once again loaded, ready for the next visitor. We used a simple batch file to control the slide sequence and prototype in a loop so that the exhibit could run continuously and independently. On the table we pasted a page reiterating the VE controls and the slides explaining questions, exchange structures and story objects. The full contents of this page are given in Appendix E, Section E.2. Additionally, we modified the keyboard used to make it easier for visitors to see which keys to use. We sprayed all the keys black and labelled only the keys needed to interact with the prototype i.e. the letters, arrows and Space, Enter, Escape, right-hand Shift, Back space and Delete keys. The relabelled keyboard is shown in Figure 8.4 below. Finally, we left feedback forms and pens on the table.

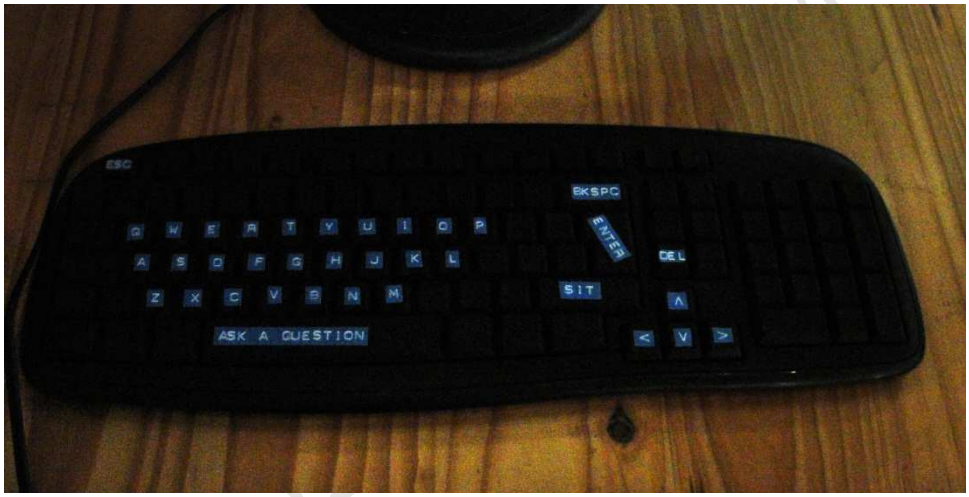


Figure 8.4 The keyboard used for the museum exhibit. We sprayed all the keys black and labelled only the keys needed for using the prototype i.e. the letters, Space, Back space, Delete, Enter, Escape, right-hand Shift and arrow keys.

Pilot Trial:

Before deploying the exhibit at the museum itself, we ran a small pilot laboratory trial with eight volunteer Computer Science students who had not seen the prototype before. The aims were to identify any major technical issues with the updated prototype and ensure that the introductory slides were understandable and sufficiently facilitated successful use of the prototype. We found that the prototype worked well and the slides required minor wording improvements.

8.2.2. Procedure & Measures

We set up our exhibit for nine days and discreetly observed visitors using it. For the most part visitors were unaware that the exhibit was being observed and, since the exhibit ran on its own, our intervention was usually not required. As in Studies Two and Three, the prototype automatically logged all usage activity. We also provided a short feedback form, for visitors to complete, if they wanted. However, the museum was an uncontrolled real-life setting and visitor feedback was prone to a number of possible biases. For instance, the exhibit's sign identified it as new in the museum, so visitors might have been biased toward giving complimentary feedback to please the museum. In

classical experiments, the tendency for participants to aim to please a perceived experimenter, or superior, in this way is termed the experimenter effect (Rosenthal, 1964; Kintz, et al., 1965). Another bias, the halo-effect, can take place when one positive attribute of an artefact significantly influences the judgment of other, unrelated, attributes. In human-computer interaction, some studies have suggested that favourable judgments of a user interface's aesthetics correlates with significantly more positive judgments of other attributes, such as engagement, usability and content (De Angeli, et al., 2006). In Study Four, we were aware that museum visitors might be swayed to judge our prototype more positively due to its (a) association with the museum and the District Six content and (b) perceived novelty as an interactive digital storytelling application and a new exhibit at the museum. If visitors were highly engaged with the museum and its content then our storytelling exhibit might have been perceived as more positively by association. Additionally, if visitors were found the exhibit novel they may have biased them to give positive feedback more because of the perceived novelty than the prototype design. Thus, it was important to not rely solely on visitors' self-reported story experience and feedback

Hence, we considered three measures for judging the museum visitor's experience of the prototype: (1) observing and noting their actual behaviours; (2) usage logs and (3) their story experience ratings and comments on the feedback form. We describe these in detail in the following two sections.

User Activity Logs:
We logged the same usage activity logged in Studies Two and Three, namely the number of:

- Hand-ups to ask a question (both during the course of a story and during question opportunities)
- Questions entered
- Times question input was cancelled
- Questions which were unsuccessfully answered by the storytelling agents
- Times there was a timeout during question opportunities
- Attempts at answering exchange structures
- Times exchange structure input was cancelled
- Exchange structure inputs that were not recognized by the storytelling agents
- Exchange structures that were successfully answered by the user

Recall, that Studies Two and Three's participants were required to listen through all five of the prototype's narratives. A notable difference here was that museum visitors were free to leave whenever they pleased. Thus, we also logged the number of narratives and the exchange structures that museum visitors experienced before leaving the exhibit.

Feedback form:
Since Study Four's participants were not paid volunteers, we could not expect them to fill out the lengthy questionnaire used in Studies Two and Three. Therefore, we created an abridged feedback form entitled "Tell us what you think!" based on the full questionnaire. Visitors completed this form, shown in Appendix E, Section E.3, voluntarily. It asked visitors to note their age, gender and nationality. For nationality, we categorised visitors as either South African or foreign. In the interests

of keeping the questionnaire brief, we did not collect data for Interest Tendency or Existing Knowledge as in Studies Two and Three. To get an approximate idea of visitors' story experience, we included one item per story experience dimension. Each of the following four items asked visitors to rate their experience on a seven-point Likert-type scale; we have indicated what each one was intended to measure:

- I would like to find out more about District Six. (*Interest*)
- I enjoyed my experience of the stories. (*Enjoyment*)
- I would characterise my experience of the stories as captivating. (*Engagement*)
- I felt like I was listening to real-life storytelling. (*Storytelling Realism*)

With only one item to measure each story experience dimension, this questionnaire could not be tested for psychometric soundness. Therefore, we only conducted descriptive statistical analyses using these scores. Finally, the feedback form allowed visitors to note any general comments about the exhibit.

8.3. Results

A total of 113 visitors approached the exhibit, of these 93 read all the introductory slides and experienced the VE, and 67 completed a feedback form. Forty-nine visitors were foreigners, and 19 were South Africans. There were 38 women and 31 male visitors and ages ranged from 9 to 68 with a mean age of 32. In the following sections we outline responses to the exhibit based on our observations, usage logs, story experience scores and visitor's qualitative feedback. Finally, we describe reactions of the museum staff, particularly Joe and Noor, to the exhibit.

8.3.1. Observations

Observing visitors to the exhibit gave us insights into their experiences there that we would not have been able to glean from the usage logs or feedback forms. Some reactions reinforced our design decisions while others hinted at ways the prototype might be improved for use in a public setting. The museum differed from the experimental setting of Studies Two and Three in two crucial ways. First, museum visitors used the prototype voluntarily and, secondly, people usually visited the museum in groups. Additionally, we were placing digital versions of Joe and Noor in the same setting where they tell their stories in-person. Here we present the most important, and consistent observations.

Attraction to the Exhibit:

We observed different levels of willingness to approach and engage with the exhibit. Older visitors where usually more hesitant to approach, while younger visitors, especially children and teenagers, did so eagerly and confidently. Sometimes, seeing other visitors using the prototype also attracted subsequent visitors.

The Introductory Slides:

While we tried to keep the introductory slides concise, 20 visitors left the exhibit without reading all the slides. However, most who did read the slides were able to use the prototype effectively. But, 25

out of the 93 visitors to exhibit required some help from us when the VE first loaded. Most of these did not remember to press the Enter key once the VE had loaded to start the storytelling. Others did not realise, or remember, that they needed to move the mouse to look around the VE. A handful, inadvertedly closed the prototype window requiring us to reopen the window for them.

Time Spent at the Exhibit:
On the first day of Study Four, we were surprised that, of the 7 visitors who engaged with the prototype, 6 left before the *first* story completed. This prompted us to consider what might make visitors listen for longer. Since these 6 visitors had left during the first, preset, narratives, we suspected something about that narrative (Noor's Mixed Marriage narrative) was failing to engage them. So, on the second day, we tried a version of the prototype which allowed all five narratives to be accessed via story objects (the equivalent of Study Three's *O* condition). This allowed visitors to choose the first story they would hear. Of the 12 visitors who engaged with the exhibit that day, only 2 left before the first story was finished while the rest completed between 1 and 4 stories. Thus it appeared that using story objects to trigger all the narratives made visitors stay for longer. We decided to test this properly, so, for the rest of Study Four, we alternated between the *PO* and *O* versions of the prototype. By the end of the 9 day exhibit, 44 visitors had experienced the *PO* version and 49 the *O* version. In the next section, we present the results of comparing the *PO* and *O* user logs, which, indeed showed that using story objects resulted in longer visitor engagement.

During the rest of the study, we observed visitors leave the exhibit for a variety of reasons. The museum is visited many foreigners and many non-English speaking visitors left the exhibit upon realising that was English only. A number of, usually older, visitors left upon encountering their first exchange structure in the VE and appeared uninterested in participating in an interactive exhibit. In one case, such a visitor explained in their feedback that they thought the exhibit would be a passive experience akin to a video presentation. So, sometimes the VE's interactivity was actually a deterrent. Some visitors appeared surprised or uncertain about how to react to the storyteller agent asking them a question. While, the introductory slides should have prepared visitors for upcoming interactions, the slides might not have been clear enough or may not have been read thoroughly by all visitors. Another visitor, who left after encountering their first exchange structure, told us that she did not know the answers to the storyteller's questions and felt the exhibit was aimed at school children rather than adults. Most often, it seemed that visitors left due to having limited time or being part of a group that leaving the museum's main hall. Tour groups with time constrained itineraries visit the museum daily. Often these visitors could not engage with the exhibit for a significant amount of time, and those who did were usually called away becuase their group was leaving the museum. When asking these visitors to complete a feedback form, a handful stated that, if they did not have to leave, they would have liked to listen for longer.

Using the Prototype:
While visitors were using the prototype we observed reactions that suggested engagement, such as giggling and gasping. But, overall there were fewer of these noticeable reactions than in Studies Two Three. Many visitors, particularly adults, sat quietly, listening passively as though watching a video. Numberous visitors even sat with their hands away from the keyboard and mouse, interacting only to press Escape during the exchange structures or select story objects. On the other hand, children and teenagers often appeared to want *more* interaction. Some younger visitors listened attentively

and attempted to ask questions and answer exchange structures while others appeared bored while listening to the non-interactive parts of narratives. They often pressed the key for asking questions repeatedly or navigated rapidly, and continually, around the VE or clicked mouse repeatedly – all to the apparent exclusion of listening to the stories.

Furthermore, observing people use the prototype highlighted a few specific usability issues:

- Many visitors typed slower than we had anticipated meaning the time limit placed on entering questions and exchange structures answers was too short leading to the typing dialog timing out while they were still typing.
- After start-up, the prototype requires users to press Enter to start the storytelling. However, as we mentioned earlier, this was not clear to a number users.
- Some visitors appeared to try and find a way to opt out of a narrative once it had begun, but this was not possible.
- A number of visitors had difficulty adjusing to using the mouse suggesting that it was too sensistive.

A Single-User Prototype in a Public Setting

We routinely observed a scenario where the visitor currently engaging with the exhibit was interrupted by other visitors. Sometimes a companion would interrupt only briefly, but often the visitor at the exhibit would hand over the headphones to their companion to allow them to experience the VE as well. Visitors with children often handed over the headphones to their children. Often two or more visitors gathered at the exhibit simultaneously, taking turns listening through the headphones – especially among groups of children, teenagers and school groups. Sometimes, large groups of children, who all wanted to listen to the stories, formed a crowd at the computer. In fact, of the 93 distinct visits to the exhibit, 24 involved more than one user. Figure 8.5 shows some photographs of mulitple visitors gathered at the exhibit. This was, of course, not ideal as the prototype was designed as a single-user experience. Unfortuantely, groups of visitors at the exhibit usually resorted to passing the headphones around. Consequently visitors who were handed the headphones did not get to read the introductory slides, which meant that they would not have known the VE controls or how the interactions worked. In one instance a girl handed the headphones to her brother who, upon encountering an exchange structure input box, tried to input a question, rather than answering the storyteller agent's question. Occassionally we even observed situations where one visitor would be wearing the headphones, while another controlled the mouse.

Unexpected Situations:

In addition to the many visitors using the prototype simultaneously, there were other situations we did not anticipate. For one thing, the museum presented numerous distractions from the exhibit (in addition to interruptions from visitors' companions). Occasionally visitor's mobile phones rang drawing their attention away from the exhibit, other exhibits distracted a small number of visitors who spent some of their visit to our exhibit looking up at the nearby banners and Streets exhibit – one even took pictures while listening to the storytelling. We have already mentioned that, since the prototype was implemented in English, language was an issue for some visitors. On one occasion a group of Afrikaans-speaking children, who were unable to read the introdcutory slides, gathered around the exhibit, but were uncertain about how to use it. They could be heard asking each other

whether it was a game and they did not understand what they should type in the exchange structure input dialog. We intervened to help which led to one of the children asking the researcher to translate and type their questions in English. There were also some unexpected situations around exchanges structures and questions. With exchange structures we noticed that when, particularly children, did not know the answer to a storyteller agent's question, they might call on their parents for help inputting answers. An unexpected use of questions arose from the fact that it is common for school students to visit the museum for help with assignments. In two instances, one with a group of students and another with a single student, there were attempts to directly input assignment questions into the prototype. These school assignment questions were, typically, very general, while the prototype's question repertoire related mainly to Joe and Noor's personal histories meaning that the storyteller agents were not robust enough to provide them useful answers.

Figure 8.5 Photographs a common situation during Study Four – multiple visitors gathered at the exhibit simultaneously. In the top left photograph a group of children, with an adult, took turns passing around the headphones. Top right shows a school group who took turns with the headphones. Bottom left shows a family visit: the woman started out using the exhibit and then passed the headphones to a boy seated at the computer and watched him engage with the VE along with a male companion. Bottom right shows a group of siblings; the girl with the headphones was continually interrupted but her sister and brother who also wanted a turn at the computer.

Digital and Real-life Storytelling:

We deployed our prototype, which aims to mimic Joe and Noor's storytelling, in the same setting where they tell their stories. Thus, we paid attention to the co-existence our exhibit and their storytelling. As one would expect, our exhibit was clearer secondary to their tours. So, if a tour started while a visitor was at the exhibit, they tended to leave to join the tour. The only clash we

observed between the exhibit and a real tour involved a teacher who began using the prototype while waiting for a tour with Noor and her students to begin. When Noor began the tour, the teacher was still at the exhibit leading him to coax her away saying "No, no please don't look at those faces there". More often, the exhibit actually encouraged visitors to seek out and engage with Joe and Noor with a few visitors to the exhibit pleasantly surprised to discover that the Joe and Noor depicted in the VE were actually available in-person at the museum. Since there was a tendency for more tours to take place in the mornings, whilst in the afternoons Noor and Joe were more likely to tend to the book store or front desk. This was particularly the case on quiet days, and on busy days they would give more tours throughout the day. On some afternoons, Joe even directed visitors to our exhibit telling them that they could hear his stories there.

8.3.2. User Activity

Narratives Completed:

Over the full 9 days, 39 visitors left the exhibit before completing the first narrative while 54 listened to more than one story. Descriptive statistics for the number of narratives completed (*NC*) are shown in Table 8.1. Visitors completed a mean of 1.13 stories and the distribution for *NC*, shown in Figure 8.6, reflects that most visitors listened to part of one story or completed one story; in fact almost half the sample listened to less than one narrative. This distribution was significantly non-normal (W=0.79, $p < 0.001$) and skewed (skew = 1.13) towards less narratives being completed.

	Min	***Median***	***Mean***	***Std. Dev.***	***Max***
Narratives Completed	0	1.00	1.13	1.58	5

Table 8.1 Descriptive statistics for number of narratives the museums visitors completed in Study Four (n = 93).

In Section 8.2.2, we described how we came to deploy two versions of the prototype: *PO* where the first two narratives were pre-set and the remaining three accessed via story objects; and *O* where all the narratives were accessed via story objects. We hypothesised that the *O* version might lead to visitors listening to more narratives. To test this, we constructed a linear model for *NC* which tested for the effect of different levels of story objects (*PO* or *O*), age, gender and nationality (foreign or South African). But, we were unable to find a significant linear model for *NC*. Therefore, we compared *NC* in the *PO* and *O* versions using a Wilcoxan signed rank test (a one-way non-parametric ANOVA, since *NC* was not normally distributed). There was indeed a significant difference between *PO* and *O* (W = 1344, p = 0.03) and the means plot in Figure 8.7 shows that visitors who experienced the *O* version of the prototype completed significantly more narratives. Figure 8.7 further shows that effect was relatively small: visitors experiencing the *PO* version completed a mean of about 1.1 narratives and those experiencing the *O* version completed mean of almost 1.6 narratives. So, the use of story objects led to visitors to listen to about half a narrative more.

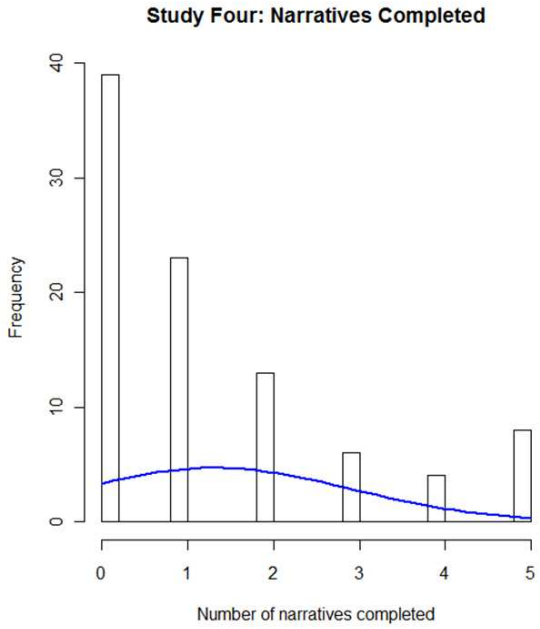


Figure 8.6 A histogram plot showing the number of narratives visitors completed in Study Four (n = 93). The probability distribution (also shown) was significantly non-normal (W=0.79, *p* < 0.001) and positively skewed (skew = 1.13).

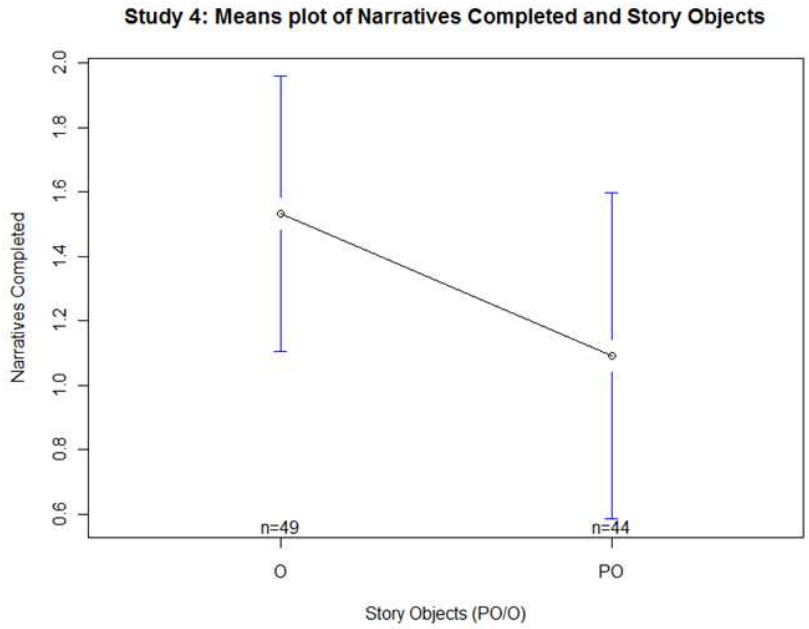


Figure 8.7 Means plot showing the significant effect of story objects (*PO* or *O*) on the number of narratives completed by visitors to our exhibit. In the *O* condition, where all the prototype's narratives were triggered by clicking on story objects, visitors completed a mean of a half a narrative more than in the *PO* condition, where only the last three narratives were accessed via story objects.

Questions:

As in Studies Two and Three, we judged positive engagement with questions from the number of "hand-ups" (i.e. pressing a key to indicate the desire to ask a question) and the number of questions entered. We also considered hand-ups and questions occurring during story narrations and question

opportunities separately. We judged negative engagement by looking at number of times question inputs were cancelled (by pressing Escape) and how often question opportunities timed out. Table 8.2 below gives descriptive statistics for all of these.

	User activity	***Min***	***Median***	***Mean***	***Std. Dev.***	***Max***
Hand ups:	*During story narration*	0	1	1.56	2.78	13
	Question opportunity	0	0	0.6	1.4	8
	Total	0	1	2.16	3.55	17
Questions Entered:	*During story narration*	0	0	1.12	2.37	11
	Question opportunity	0	0	0.52	1.32	8
	Total	0	0	1.62	3.05	14
	Question cancellations	0	0	0.42	0.85	5
	Question opportunity timeouts	0	2	2.12	2.14	7
	Unrecognised questions percentage	0	57.14	51.93	40.36	100

Table 8.2 Combined descriptive statistics for questions usage in the *Q* condition data from Study Four (n = 93).

The numbers of hand-ups and questions entered were disappointing as visitors did not ask many questions with a mean of 2.16 hand ups and 1.62 questions entered. Figure 8.8 shows that many visitors (54) did not enter any questions. We did see a small difference between the number of questions entered during story narrations and question opportunities with more questions entered (mean = 1.12) during stories than question opportunities (mean = 0.52). There were almost no question cancellations (mean = 0.42) and only a few instances in which question opportunities timed out (mean = 2.12).

Recall that we attempted to improve the storyteller agents' question-answering capability (see Section 8.1). However, that fact that visitors in Study Four entered very few questions, made it difficult to test the efficacy of these changes thoroughly. We excluded the 54 user logs in which no questions were entered from consideration and Table 8.2 above gives descriptive statistics for the percentage of unrecognised questions for visitors who did input questions. A mean of 51.93% of questions were not recognised (leading to an "I don't know" response). Even though this was a 12.73% improvement on Studies Two and Three, it was high.

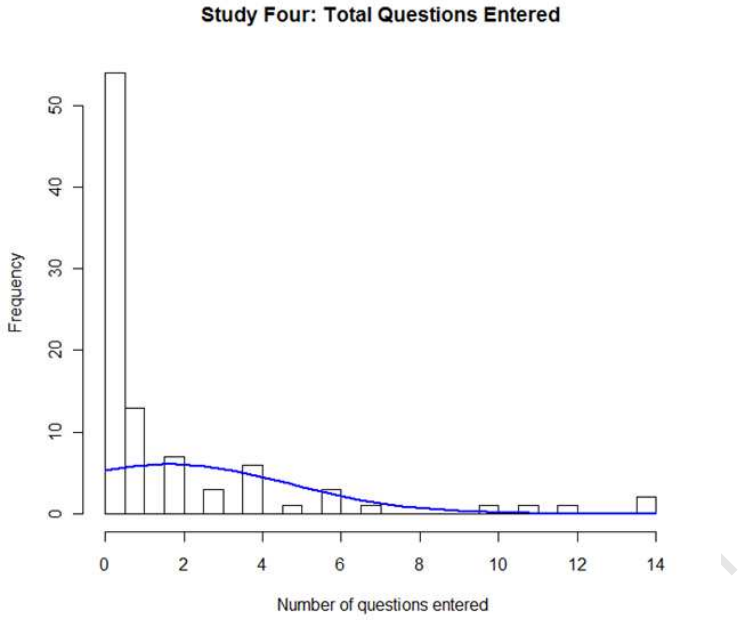


Figure 8.8 A histogram plot showing the total number of questions entered by visitors in Study Four (n = 93). The probability distribution (also shown) was significantly non-normal (W=0.60, $p < 0.001$), positively skewed (skew = 2.50) and leptokurtic (kurtosis = 6.13).

We also tested whether visitors' demographics and story objects (*PO* or *O*) affected question activity using a series of linear models. We found that age and story objects had a significant effect on the number hand-ups and questions entered. The hand-ups linear model *(*$F = 10.99$, $R^2 = 0.42$*,* $p < 0.001$) reveals story objects and as significant predictors (see Table 8.3). A negative regression coefficient ($t = -5.23$) between hand ups and age indicates an inverse relationship such that younger visitors put up their hands more than older visitors. A means plot for effect of story objects on hand-ups is, shown in Figure 8.9, shows that visitors who experienced the *PO* version had a mean of about 2.6 hand ups – 1 greater than those who experienced the *O* version. The outcome of the linear model for number of questions entered ($F = 10.53$, $R^2 = 0.41$*,* $p < 0.001$) was essentially identical: age and story objects were significant predictors (see Table 8.4). Once again, the number of questions entered had an inverse relationship with age, as indicated by their negative regression coefficient ($t = -526$). Significantly more questions were entered in the *PO* prototype version. Figure 8.10, shows that visitors who experienced *PO* entered about one question more than those who experienced *O*.

"Hand ups" predictor	***F value***	***p***
PO/O	***5.18***	***0.03***
Age	***32.13***	***< 0.001***
Gender	3.64	0.06
Nationality	2.99	0.10

Table 8.3 A summary of the predictors in the linear model for the number of times visitors pressed a key to put their hand up in the VE (F = 10.99, $R^2 = 0.42$ $p < 0.001$) in Study Four. Significant predictors Story Objects (*SO*) and age are shown in bold and italics

Questions entered predictor	*F value*	*P*
PO/O	***5.87***	***0.02***
Age	***31.75***	***<0.001***
Gender	2.40	0.13
Nationality	2.10	0.15

Table 8.4 A summary of the predictors in the linear model for the number of questions entered by visitors (F = 10.53, R^2 = 0.41, p < 0.001). Significant predictors are shown in bold and italics. Here, Story Objects (*SO*) and age were significant predictors.

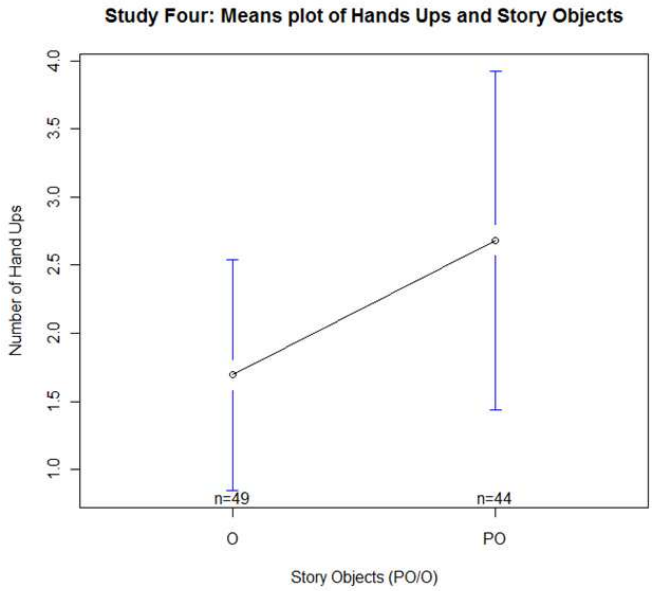


Figure 8.9 Means plot showing the effect of story objects (*PO/O*) on the number to times visitors in Study Four pressed a key to put up their hand in the VE (i.e. to indicate that they wanted to ask a question). There were significantly more hand ups in the *PO* condition, where pre-set narratives and story objects were combined, as opposed to *O*, where all stories were triggered by clicking on story objects.

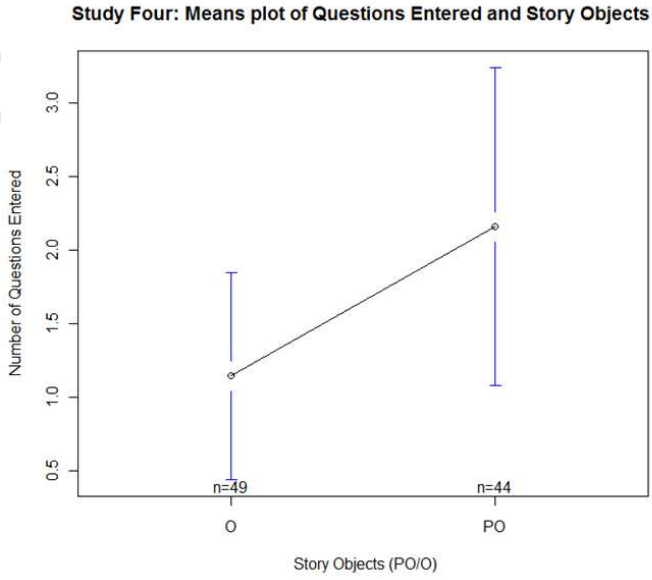


Figure 8.10 Means plot showing the effect of story objects (*PO/O*) on the number questions entered in Study Four. Significantly more questions were entered in in the *PO* condition, where pre-set story and story objects were combined, as opposed to *O*, where all stories were triggered by clicking on story objects.

Exchange Structures:

For exchange structures we looked at the number of attempts made at answering questions posed by the storyteller agents and the number of times participants opted out of answering (by pressing Escape). The prototype contained seven exchange structures, but, since many visitors did not experience the prototype's full content, they also did not experience all the exchange structures. In fact, visitors experienced a mean of 3.5 exchange structures, and 9 visitors did not experience any. Hence, we first removed the 9 logs of visitors who experienced no exchange structures from consideration here and considered the exchange structure data relative to the number of exchange structures experienced by each visitor. Table 8.5 below gives descriptive statistics for exchange structures.

User activity	***Min***	***Median***	***Mean***	***Std. Dev.***	***1st Quartile***	***3rd Quartile***	***Max***
Exchange structures experienced	0	4	3.50	2.14	2	5	7
Average answer attempts per exchange structure	0	0.5	0.73	0.86	0	1.25	3.5
Average input cancellations per exchange structure	0	1.5	1.49	1.16	0.5	2.22	4.5
Non match percentage	0	77.5	68.82	34.07	40	100	100
Percentage of exchange structures answered by user	0	0	15.89	25.56	0	25.89	100

Table 8.5 Combined descriptive statistics for user activity related to exchange structures in Study Four (n = 93).

There was a mean of only 0.73 answer attempts per exchange structure experienced. The distribution of answer attempts, shown in Figure 8.11, revealed that many visitors did not attempt any answers since there was a significant peak at 0 (kurtosis = 0.68). We observed many passive visits to the exhibit (see Section 8.3.1). The data here shows that, on average, visitors opted out of answering 1.49 times per exchange structure they experienced. The distribution, also shown in Figure 8.11, showed a significantly non-normal ($W = 0.94$, $p < 0.001$) spread of data that was neither skewed nor clustered around any one particular value.

We also looked at the proportion of participants' inputs that were not recognised by the storytelling agents and the number of exchange structures that were successfully answered by the visitors. Since most visitors did not experience all the exchange structures, we calculated the latter as a percentage of total number of exchange structures experienced. Table 8.5 gives descriptive statistics for these and shows that many answer attempts were not recognised with most values lying between 77.5% and 100%, and a mean of 68.82%. Also, visitors were able to answer, and hence terminate, only a small proportion (mean = 15.89%) of the exchange structures they experienced.

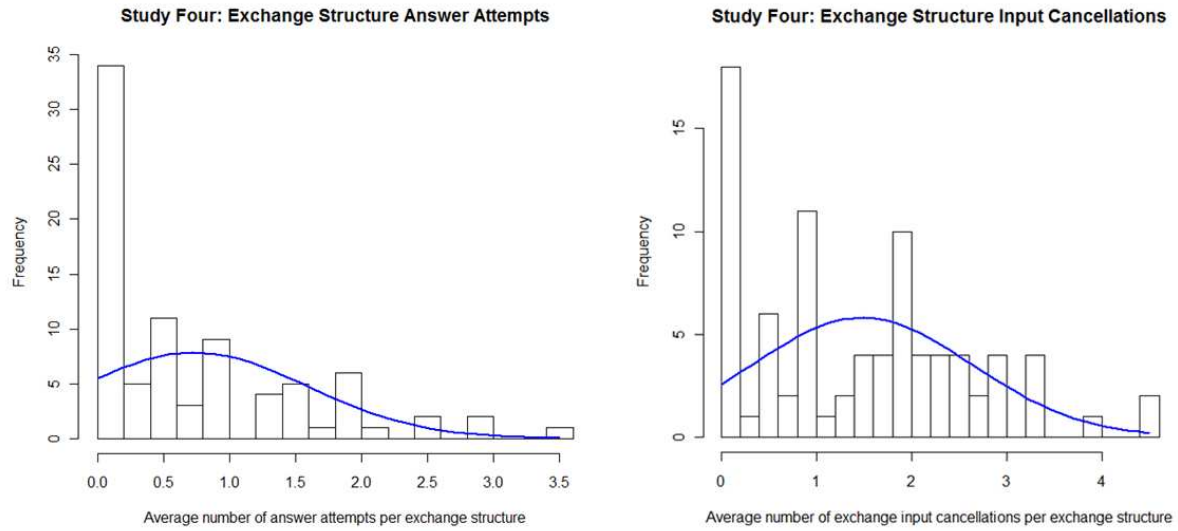


Figure 8.11 These two histograms show the main exchange structure activity in Study Four (n = 93). The left hand plot shows the average number of attempts visitors made at answering each exchange structure they experienced. The right hand plot shows the average number to times visitors pressed Escape to avoid giving input per exchange structure they experienced. These graphs also show the probability distribution curve for both. The number exchange structure answer attempts was significantly non-normal (W = 0.83, $p < 0.001$) and significantly positively skewed (skew = 1.19) and leptokurtic (kurtosis = 0.68). The number of input cancellations was also significantly non-normal (W = 0.94, $p < 0.001$).

Lastly, we tested to see if story objects (*PO* or *O*) had any influence on exchange structure usage via linear models. Story objects did not significantly influence any of the exchange structure usage activity we logged. However, age was a significant predictor of answer attempts such that younger visitors tended to enter more answer attempts (t = -2.11). The predictors for the linear model constructed for answer attempts (F = 3.89, R^2 = 0.11, p = 0.03) are summarised in Table 8.6 below. Nationality was a significant predictor of the number of exchange structures successfully answered such that South African visitors answered significantly more exchange structures than foreigners. The predictors to for this linear model (F = 2.81, R^2 = 0.16, p = 0.03) are summarised in Table 8.7 below.

Predictors for answer attempts per exchange structure	***F value***	***p***
PO/O	3.33	0.07
Age	***4.45***	***0.04***

Table 8.6 A summary of the predictors in the linear model for the average number answer attempts visitors entered per exchange structure they experienced (F = 3.89, R^2 = 0.11 p = 0.03) in Study Four. Age, shown in bold and italics, was a significant predictor with an inverse relationship with the number of answer attempts (t = -2.11). Therefore, younger visitors entered significantly more attempts to answer exchange structures.

Predictors for exchange structures answered by user	***F value***	***p***
Gender	2.57	0.11
Nationality	***5.19***	***0.03***

Table 8.7 A summary of the predictors in the linear model for the percentage of exchange structures that were answered by visitors (F = 2.81, R^2 = 0.16 p = 0.03) in Study Four. Nationality, shown in in bold and italics, was a significant predictor such that South African visitors were able to answer significantly more exchange structures than foreigners.

Rating	*Minimum*	*Median*	*Mean*	*Std. Dev.*	*1st Quartile*	*3rd Quartile*	*Maximum*
Interest	1	7	6.12	1.23	6	7	7
Enjoyment	1	6	5.95	1.26	5	7	7
Engagement	1	5	5.39	1.40	4	7	7
Storytelling Realism	1	6	5.82	1.59	5	7	7

Table 8.8 Descriptive statistics for story experience ratings in Study Four (n = 93). Ratings were quite high with most values lying between 5 and 7 (the maximum). Additionally, most of the means were close to 6 or 7

8.3.3. Story Experience

As Table 8.8 above, shows visitors self-reported ratings for story experience, on scales from 1 to 7, were quite high. Most means were close to 6 and distributions for all these scores were significantly non-normally distributed and showed some non-significant skew towards higher values. Furthermore, the distributions for Interest, Enjoyment and Storytelling Realism were significantly clustered around the 6 and 7 values. This mimicked the pattern for Interest, Enjoyment and Storytelling Realism scores in Studies Two and Three. The only rating which did not fit this pattern was Engagement, which, while still quite high, showed the most even spread of values. Table 8.9 below gives the Shapiro-Wilks normality test results as well as the skew and kurtosis values for all the story experience ratings.

Variable	*Shapiro-Wilks normality Test*	*Skew*	*Kurtosis*
Interest	***W = 0.74, p < 0.001***	-1.75	***3.54***
Enjoyment	***W = 0.79, p < 0.001***	-1.41	***2.32***
Engagement	***W = 0.89, p < 0.001***	-0.53	-0.22
Storytelling Realism	***W = 0.76, p < 0.001***	-1.45	***1.32***

Table 8.9 This table shows the outcomes of testing for normality, skew and kurtosis of story experience ratings in Study Four (n = 93). All the ratings were significantly non-normally. Interest, Enjoyment and Storytelling Realism all showed some non-significant, negative skew and were significantly leptokurtic. Of all the ratings Engagement showed the most diverse spread of values. Significant results ($p < 0.05$) are shown in bold and italics.

8.3.4. Qualitative Feedback

Visitor's feedback form comments were generally very complimentary of the exhibit, such as the following which indicated enjoyment of the stories, interactions and virtual audience:

> *Definitely one of the best interactive installation(s) I've seen at the museum. Loved the way you could both ask and answer questions. Also really interesting to hear the questions others had asked.*

Just like Study Two and Three's participants, many focused on the narratives themsleves reporting that they were touching and enjoyable. Two of the most notable compliments came from foreign tourists. A young boy commented that his experience felt like a real lesson:

> *I found it like a real lesson but parts of it I could not understand and my best part was Richmond St and most of my questions were answered.*

Much of the audio use for the soundtrack came from school group tours and we had applied classroom discourse analysis in our design. Comments such as these suggested that the prototype successfully translated the classroom atmosphere of Joe and Noor's tours. The second notable comment came from an American teacher who visits the District Six Museum, with students, yearly. She had heard Noor's tour numerous times and commented that she felt that the exhibit was a great addition to the museum as a substitute for times when Joe and Noor are not available. A few other participants echoed the sentiment that the exhibit could be a stand-in for when Joe and Noor are not available.

Some visitors mentioned that the storyteller agents were unable to answer their questions and made suggestions such as having a list of available questions to chose to ask. But, overall there were less criticisms of questions than in Studies Two and Three. A few visitors even mentioned that their questions were successfully answered.

There was an unexpected trend in the comments: a number of visitors singled out the prototype's interactivity as a *detractor* and stated that they would have preferred continuous, static storytelling they could listen to passively. All of these criticisms, such as the three shown below, came from adult visitors:

> *I didn't like the long pauses (question time). Disruptive and one loses interest. Continous commentry more suitable for adults. I did learn a lot.*

> *Excellent story and great concept. Did not enjoy the "interactive" elements of story (i.e. questions, clicking…). I just wanted to listen to story without interruption…*

> *Graphics and keyboard function difficult to use - would probably be better as just a real-life account audio piece*

That final comment also suggests that this particular visitor found the controls difficult and this theme recurred in a handful of other comments as well. Where the controls were an issue, visitors usually singled out the navigation of the virtual space and selection of story objects. One participant also mentioned that they would have liked the ability to "skip or fast forward" as desired, particularly where a storyteller's answer to a question was "not pertinent to the question".

8.3.5. Museum Staff and Storytellers' Reactions

In addition to seeing how real museum visitors responded to the prototype, we were eager to see what Joe and Noor, and other museum staff's reactions would be. We had already presented an

early version of the prototype to most of staff opinions (see Chapter 5, Section 5.5.3). We hoped to see their reactions to having the updated prototype in the museum and to using it for themselves. Only a handful of staff were able to stop by to try out the exhibit, and those who did, stated that it felt it was similar to hearing the real Joe and Noor. So much so that, no staff member listened for very long – one staff member remarked that he had heard all the stories already. In fact, most staff members have heard the stories we chose for the prototype many times. This most likely this made listening to them again in full, via our prototype, less appealing. On the whole, the interactions also worked really well for staff, which was hardly surprising since they know what questions Joe and Noor usually answer and they also heard the exchange structures they typically employ in their tours and hence knew the right answers.

We were aware that placing digital versions of Joe and Noor in the museum might encroach on their domain and function as the museum's resident storytellers. So, we were careful to describe the prototype as being secondary to their storytelling and that we welcomed their criticism. Still, we reassured by both Joe and Noor that they thought the prototype was a good way to permanently preserve District Six ex-residents' stories. Despite this affirmation though, neither were interested in using the prototype saying that computers were "not their thing". While Noor was happy for visitors to experience his stories through our prototype, there were isolated instances (as described in Section 8.3.1) in which he explicitly preferred visitors to listen to his tours over the prototype. Joe had more positive remarks about the prototype – on one occasion, while talking to visitors, he gestured toward the first introductory slide displayed on the screen and said *"You see those beautiful pics there – we the avatars!"*.

8.4. Study Four Follow Up: Visitor Engagement Workshop

Upon Study Four's completion, we participated in a workshop on visitor engagement at the museum attended by the museum's directors, curators and other staff, including Joe, to give feedback on our initial findings and discuss how the museum could build upon the work we had done, i.e. the prototype and our findings. We described the trial exhibit's setup, including the training slides and feedback forms and how we tested two versions of the prototype (a *PO* and *O* version). We explained that the felt the version where all narratives were accessed by clicking on story objects was more successful at keeping visitors engaged (this was later confirmed during usage log analysis). The fact that visitors often left the exhibit while narratives were in progress gave rise to a discussion where most museum staffers agreed that this would most likely not occur with human storytellers. The issue of respect for ex-residents' narratives arose – it is important to the museum staff, particularly ex-residents that visitors listen to their narratives in full. Unfortunately, our trial exhibit showed that the use of digital storytellers might compromise this ideal. We discussed visitors' positive and critical feedback and those issues that arose as a result of the museum setting, such as the differences between how older and younger visitors engaged with the prototype, the mismatch between the prototype, as a single-user system, and museum as a setting with visitor groups who attempted to share the experience. Regarding the former, one curator noted that future digital storytelling exhibits could benefit from providing more clarification up front on what the exhibit is and what, in terms of its interactivity and duration. Regarding the latter, we suggested that it might be better to allow multiple visitors experience the narratives simultaneously. We described the language barrier issues we had noted for non-English visitors. However, it was agreed that this was

not an issue that specifically applied to the prototype, but museums in general. Joe commented "I'd love to speak in five different languages but it's not possible." The museum staff agreed that English is an accepted *lingua franca* in museums, making it an acceptable language for catering to most foreign visitors. They did feel that they would like to seek out ways to include more local languages such as Xhosa and Afrikaans.

Finally, we discussed how to effectively conclude the collaboration between the researchers and museum. The final step would entail giving the museum "adopting" the prototype in a form that they could run and edit. We agreed to fix implementation issues identified during Study Four and remove the automatic usage logging. The workshop attendees discussed future directions the museum could take with the prototype and digital storytelling in general. A number of possibilities were discussed. First, placing it in the museum itself; Study Four had given useful insights into how it would, and would not, work as an exhibit. Second, place it in a resource centre the museum planned to build as a space for teaching and providing students with resources for projects. Third, making the prototype available on the museum's website[18]; including a version for mobile devices, particularly mobile phones[19]. This possibility, however, raised two issues. One, it might discourage people from visiting the museum itself; any content presented like this should encourage future visits to and interactions with the museum. Second, it might be viewed as a replacement of Joe and Noor's roles as the museum's resident storytellers. Throughout our work, we expected some tension to arise from the fact that our prototype aimed to present the very same narratives and storytelling style they use in the museum. This is why we always positioned them as the experts from whom we were learning and aimed to be sensitive to any side-lining they might feel as a result of our work. However, they never gave any indication of negativity towards our work. Instead, we observed a confidence of their importance in the museum that no new exhibit would easily impact. The museum curators also raised the importance of including more ex-resident voices and narratives, beyond Joe and Noor's. Currently the museum presents visitors with a handful of texts and recordings of other ex-resident's narratives, but they would like to include more, for instance Menisha Collins' narratives.

8.5. Summary

This chapter describes Study Four where we placed our storytelling prototype in the District Six Museum to gauge the reactions of real museum visitors to an interactive digital storytelling system. We used major lessons learned from Studies Two and Three to improve the storyteller agent's question-answering capability and the prototype's soundtrack quality. Then we created an exhibit which included a number of introductory slides to contextualise the prototype content and provide instructions on using the prototype. which was deployed at the museum for 9 days where we observed visitors using the prototype, logged their usage and provided voluntary feedback forms to allow them to rate their story experience (on scales from 1 to 7) and give qualitative feedback.

[18] The museum has made one foray in this direction in the form of an interactive map, on their website, entitled *Stan's Walk.* Users successively click to move through the map and each movement is accompanied by the sound of footsteps and each destination is described via text.

[19] It would only be possible to run our prototype on platforms which support the XNA framework, namely Windows computers, phones and Xbox 360. Creating digital storytelling for most mobile phones, for instance, would require a better cross-platform solution.

We summarise our main findings here:

1. *Visitor's overall response was positive, but many also engaged passively with the prototype* – Story experience ratings were all very high and, were all non-normally distributed and clustered around higher end of the scale. While using the prototype, most visitors sat, often with hands away from the keyboard and mouse, listening attentively to the narratives, but not participating in question and exchange structure interactions. More qualitative feedback was complimentary indicating enjoyment of the narratives, interactions and virtual audience. Particularly positive were comments that suggested that the experience had felt like a "real lesson" and a handful of comments that suggested the exhibit could serve as a stand-in for times when Joe and Noor are not personally available.

2. *A majority of visitors did not stay at the exhibit long enough to hear listen to all the narrative content* –out of 93 visits, 39 did not stay beyond the first narrative, and, on average, visitors only listened to little more than one narrative (mean = 1.13). Visitors left the exhibit for a variety of reasons: apparent loss of interest, hesitancy to participate in the interactions and, most often, having limited time in the museum or passing the headphones over to a companion.

3. *Older visitors were more hesitant to approach and interact with the exhibit compared to younger visitors* – older visitors often approached the exhibit with hesitation, while children and teenagers tended to approach actively. Additionally, older visitors appeared to prefer listening to the narratives passively; a number of adult visitors singled out the prototype's interactivity as a *detractor*, stating that they would have preferred static, continuous storytelling, akin to a video. Meanwhile, younger visitors participated in interactions readily and even exhibited boredom during the narratives' non-interactive parts. Linear models revealed that age was significant predictor of the how much interaction visitors engaged in: younger visitors entered significantly more question *and* exchange structure inputs than older visitors.

4. *The introductory slides were mostly successful at prefacing the prototype, but some visitors still required help during their experience* – 20 out of 113 participants who approached the exhibit did not click through all the slides and on to the prototype. In terms of providing adequate information for using the prototype, most visitors seemed adequately prepared, but 25 required some intervention, usually with pressing Enter to start the storytelling in the VE. Some visitors appeared surprised or uncertain of how to react during exchange structures, indicating that they were unprepared for this kind of interaction. In these cases, either the slides were not adequate or they were not read thoroughly enough.

5. *We observed mismatches between the prototype, as a single-user experience, and the museum as a public setting visited by groups of people* – of the 93 distinct visits to the exhibit, 24 involved more than one visitor. We routinely witnessed one of the following scenarios: visitors at the exhibit being interrupted by their companions; visitors taking turns to listen through the headphones or handing over the headphones to companions; and even

groups attempting to simultaneously interact with the VE. These situations would have resulted in fragmented story experiences and confusion for visitors who did not view the introductory slides.

6. *The storytelling prototype was secondary to real-life storytelling of the museum's guides* – our exhibit received more visitors when no guided tours taking place. Sometimes, when tours started, visitors at the exhibit voluntarily left, or were coaxed away. In some cases the exhibit encouraged visitors to join or seek out a tour with Joe or Noor. On other occasions where storytellers were unable to give a tour, visitors were directed to the exhibit.

7. *The use of story objects significantly affected the length of time visitors spent at the exhibit and the number of questions they entered* – this study featured two versions of the prototype: *PO* where the first two narratives were pre-set and the remaining three accessed via story objects; and *O* where all the narratives were accessed via story objects. A one-way ANOVA comparison of the two showed a significant effect wherein visitors who experienced the *O* version listened to about half a narrative more than those in the *PO* condition. Further, linear models revealed that the *PO* condition resulted in visitors, on average, putting up their hand and entering a question one time more than in the *O* condition.

8. *Visitors did not input many questions* – the mean number of questions entered was around 2 and 54 participants did not enter any questions. There were very few question cancellations (mean = 0.42) and instances of question opportunities timing out. There was only a small difference between the number of questions entered during story narrations and question opportunities.

9. *The storyteller agent's updated question repertoires resulted in their question-answering capability, but overall the proportion of unrecognised questions was still high* – the prototype was unable to recognise, on average, 52% of questions entered by visitors (a 13% improvement on Studies Two and Three). Some visitors mentioned that their questions were not answered and some made suggestions for improving the question system. Overall, there was less criticism of the question system than in Studies Two and Three.

10. *Many visitors did not engage readily in exchange structures* – usage logs showed there was a mean of 0.7 inputs per exchange structure and many visitors did not enter any answer attempts. The number of cancellations per exchange structure was quite variable and showed a mean of 1.5. On average, participants input the correct, or terminating, answer for 16% of the exchange structures they experienced.

11. *On average, 69% of exchange structure inputs were not recognised by the storyteller agents*.

12. *Observing visitors using the prototype revealed easily fixable usability issues* – including that input boxes did not give many users enough time to type their input; a number of visitors did not realise, or remember, that they needed to press Enter at the start for the storytelling to begin; a number of visitors wanted to a way to end a narrative rather than listen to it; and many visitors found the mouse (used to look around the VE) too sensitive.

Chapter 9

Studies Two, Three & Four: Discussion

The overarching aim of Studies Two, Three and Four, described in the previous three chapters, was to evaluate the digital storytelling design embodied by our prototype (both of which are described in Chapter 5). Each study addressed one of this project's final three research questions:

3. *Are techniques which encourage audience-storyteller interaction in real-life storytelling effective in digital storytelling? We consider two forms of interactivity:*
    i. ***Questions**: The user is able to input questions to a storyteller agent by raising their hand during a narrative and during question opportunities, where the storyteller agent accepts multiple, consecutive questions.*
    ii. ***Exchange Structures**: the storyteller agent poses a question and prompts the user to input attempts at answering it until the correct answer(s) are reached.*

4. *Is the use of **story objects** as a mechanism for allowing the user to choose which narratives they experience more effective than presenting narratives in a predetermined order?*

5. *Is an interactive digital storytelling system effective for engaging **museum visitors**?*

Study Two addressed question (3) above and, therefore, was designed to test to efficacy of the question and exchange structure interactions in our design. Study Three addressed question (4) by testing the effectiveness of using story objects to allow users to trigger narratives. Both of these took the form of controlled experiments where we tested the effect that question and exchange structure (in Study Two) and story objects (in Study Three) had on participant's experiences of the narratives presented in the prototype. We built on previous work to create a custom questionnaire to measure various aspects of participants' *story experience*, namely: interest in finding out more about the narratives after their experience; enjoyment; attention paid to the narratives; boredom and confusion regarding the narrative content; existing knowledge of District Six and forced removals; and participant's tendency to show an interest in personal experience narratives and South African history. We also considered our observations of participants using the prototype, logged usage patterns and participant's qualitative feedback. Study Four addressed question (5) and, there, we explored how our prototype fared in an uncontrolled public setting with real museum visitors. We deployed the prototype at the District Six Museum and analysed how museum visitors engaged with it through observation, usage logs, and short feedback forms where they rated their story experience and gave qualitative feedback.

In this chapter we tie together findings from all three studies and present our conclusions regarding the efficacy of our design. In Section 9.1, we discuss the psychometric soundness of our story experience questionnaire. Then, in Section 9.2, we discuss the effect of questions and exchange structures on story experience in Study Two. We also discuss usage patterns and qualitative feedback regarding these interactions from Studies Two and Four. Section 9.3 discusses findings from Studies Three and Four regarding story objects. Section 9.4 discusses the response of Study Two and Three's participants to the prototype in general, while Section 9.5 discusses how the prototype fared at the District Six Museum.

9.1. Story Experience: A Review of our Questionnaire

An essential part of addressing our third and fourth research questions, in Studies Two and Three respectively, was having a way to judge the effectiveness of our prototype. We did this by developing a questionnaire to measure story experience, a multidimensional construct consisting of various aspects of how people experienced such narratives. In Chapter 6, Section 6.1.2 describes how we drew from our previous work on creating a questionnaire to measure story experience. There, as in this project, we worked with narratives that were considered part of South Africa's cultural heritage (Ladeira & Blake, 2004; Ladeira, 2005). For this project, we adapted the story experience scales which had, previously, proven successful and were most applicable to this project, namely:

- ***Interest*** in finding out more about the narratives' broader context (in this case District Six, forced removals and Apartheid) in fostered
- ***Enjoyment*** of the narratives
- ***Attention*** paid to the narratives
- ***Boredom*** during the narratives
- ***Confusion*** regarding narrative content
- ***Storytelling Realism:*** the extent to which the storytelling was perceived as resembling real-life storytelling

These formed the dependent variables for Studies Two and Three. We also considered the following control variables, which we predicted might influence the above story experience factors:

- ***Existing Knowledge*** of District Six and Apartheid-era forced removals
- ***Interest Tendency:*** *the* tendency to show interest in South African history and personal experience narratives

Section 6.1.2 in Chapter 6 details how we adapted scales from our previous work for use in Studies Two and Three, while Section 7.3 in Chapter 7 gives the results of an in-depth psychometric analysis which tested the validity and reliability of each scale and the soundness of our story experience conceptualisation. We briefly discuss those results in the following two sections, the first dealing with the story experience factors (Section 9.1.1), and the second with the control facts and their impact on story experience (Section 9.1.2).

9.1.1. Interest, Enjoyment, Engagement & Storytelling Realism

The *Interest* scale was fully psychometrically sound after removing one item. Meanwhile, the *Enjoyment*, *Boredom* and *Storytelling Realism* scales were valid and showed borderline reliability. The *Attention* and *Confusion* scales were both not psychometrically sound, leading us to discard *Confusion* from consideration. But, reflecting on the *Attention* and *Boredom* scales led us to realise that they were both concerned with different sides of the same phenomenon – one with holding attention and the other with the failure to hold attention. Therefore, we combined these two to form a new factor, *Engagement*, and combining the two scales produced a psychometrically sound scale. So, all the scales in our story experience questionnaire were psychometrically sound and, we believe, improved upon our previous work in this area. Our conceptualisation of story experience was further supported by the correlations between the story experience scores from Studies Two and Three - all the story experience variables correlated positively, suggesting that they are significantly related.

9.1.2. Existing Knowledge & Interest Tendency

Existing Knowledge of District Six and forced removals did not correlate with any aspect of story experience and was not a significant predictor for any aspect of story experience. *Interest Tendency*, on the other hand, had an influential relationship with story experience. It correlated with, and was a significant predictor for every aspect story experience such that participants with higher *Interest Tendency* scores tended to report higher interest, enjoyment, engagement and storytelling realism.
Furthermore, Study Two and Three's samples reported markedly high *Interest Tendency* scores, so it was important that we were able to control for it when testing the effects questions, exchange structures and story objects on story experience. Had we not controlled for it, some of the effects found in Study Two would have been indiscernible.

9.2. Interacting with Storyteller Agents: Questions & Exchange Structures

In our digital storytelling design we aimed to replicate some of prominent behaviours we discovered in Study One's ethnography of real-life personal storytelling. We focused on two audience-storyteller interactions: questions and exchange structures. We hypothesised that including these interactions in digital storytelling would improve users' story experience compared to non-interactive, static storytelling. We also predicted that questions and exchange structures might interact since both were interactions that involved asking and answering questions. Study Two was a controlled experiment which tested the effect of questions and exchange structures on story experience. In the previous section, we described our understanding and measurement of story experience which we operationalised as a multi-dimensional construct consisting of: interest in finding out more about the narrative context; enjoyment; engagement; and how realistic the storytelling seemed. These factors formed Study Two's dependent variables and we used linear models to test the effect of questions and exchange structures on each variable. Additionally, these models controlled for participant's existing knowledge of District Six and forced removals, their tendency to show interest in Apartheid history and personal stories and a range of demographic data, namely current year of study, faculty, age, gender, nationality, hometown and race. To gain a full pictured of how questions and exchange structures were actually used, we also logged how participants interaction with them. When deploying the prototype at the District Six Museum for Study Four, measuring story experience via a lengthy questionnaire was not feasible. Therefore, we gathered a rough idea of

story experience, via a short feedback form which also allowed visitors to give open-ended qualitative feedback.

We hypothesised that the inclusion of questions and exchange structures would improve story experience and would interact with each other. Our results confirmed this hypothesis partially: including these interactions improved most aspects of story experience. Questions and exchange structures both increased interest and engagement, while exchange structures also increased enjoyment, and neither interaction affected storytelling realism. Additionally, questions and exchange structures did not interact with each other suggesting that, despite both being question-based interactions they were perceived as quite different by participants. Furthermore, usage logs showed that participants engaged readily in questions and interactions. But, they also revealed design flaws for both and, hence, avenues for improvement. Qualitative feedback indicated a mixed reaction to interacting with the storyteller agents. Some liked the interactions, and even found them realistic, while others found them frustrating – again highlighting avenues for improvement. Qualitative feedback from participants who did *not* experience the interactions yielded an unexpected outcome: a small group of participants enjoyed passively observing these interactions take place between the storyteller agents and virtual audience members[20]. They stated that observing the interactions focused their attention on the narratives; some even said that it allowed them to hear answers to questions they wanted to ask. This feedback suggests that these participants would have liked to be more than passive observers to these interactions and would have readily participated if they were able. In Study Four, we did not test the effect of questions and exchange structures on story experience, but we observe and log museum visitor's reactions to interacting with the storyteller agents. Overall, there was a mixed, less favourable reaction to the interactions and a clear pattern in which younger visitors interacted with the storyteller agents much more readily than older visitors.

In Sections 9.2.1 and 9.2.2 below, we discuss the results for questions and exchange structures respectively. For each we discuss their effect on story experience in Study Two and what we learned from the usage logs and qualitative feedback in Studies Two, Three and Four. In Section 9.2.3, we discuss possible reasons for the fact that neither interaction impacted storytelling realism.

9.2.1. Questions

While allowing users to enter questions in digital storytelling did not fulfil our hypothesis completely, they showed significant promise. Our results also indicated a number of ways in which their design might be improved toward reaching its potential as an effective digital storytelling interaction.

Effect on Story Experience:

The inclusion of questions in our prototype resulted in participants showing significantly greater interest in finding out more about District Six and forced removals and engagement in the storytelling. We expected that asking the storyteller agents questions would get users to think about parts of the narratives they wanted to know more about and, hence, predispose them to seeking out

[20] Recall that conditions without questions and/or exchange structures featured these interactions taking place between the storyteller agents and virtual audience. Therefore, participants in non-interactive conditions would passively witness them. This was done so that all participants would hear the same narrative content, even if they were not interacting directly with the storyteller agents.

more information after using the prototype. Indeed, Study Two's results showed that interest in finding out more about District Six and forced removals was significantly greater for those who experienced questions compared to those who did not, suggesting that our hypothesis was correct. However, the increased interest could also be a consequence of the low rate of successfully answered questions. Sixty-five percent of participants' questions were not answered successfully, meaning that most participants would have asked questions that the storyteller agents did not answer. It is possible that this piqued their interest in seeking answers for those questions. This possibility was reinforced by some participant's qualitative feedback which stated that the experience left them with unanswered questions. We originally hypothesised that questions would increase attention to the prototype's storytelling and decrease boredom. Ultimately, we combined these into one factor: engagement, which was comprised of high attention and low boredom levels. As predicted, including questions resulted in significantly greater engagement in the storytelling. We believe that allowing users to interact with the storyteller agents focused attention on the narratives and allowed them to participate in the storytelling. Furthermore, knowing that they could ask questions might have made users focus on the storytelling so that they could think of questions they might like to ask. We also posit that engagement with the storytelling might have been a consequence of specific design decisions. Recall that the questions design allowed users to signal the desire to ask a question at any point (as long as long as there were still unasked questions in the storyteller agents' repertoires). So, when a user pressed a key to virtually put up their hand, they would have to wait for the storyteller agent to acknowledge them and allow them to enter their question. In the very least, participants waiting to ask a question would have paid attention to the storytelling while to see when the storyteller agent to allow their question input. We also implemented question opportunities where the storyteller agents would invite the user to virtually put up their hand and ask questions. Knowing that these invitations might arise, may also have served to keep participants focused on the narratives.

Questions did not increase enjoyment as we hypothesised and we believe this is likely due to the storyteller agents' limited capability for answering participant's questions. Whenever a storyteller agent did not recognise a user's question, they would respond with "I don't know". Given the high rate of unrecognised questions, most participants heard this response, more than once, instead of hearing answers to their questions. This was almost certainly not enjoyable – in fact, a handful of participants specifically commented that they disliked repeatedly hearing the "I don't know" response. The fact that just under half of the participants (42%) who experienced questions reported disliking confirms that they were not enjoyable. Furthermore, some found the questions restrictive as it was clear, after trying to enter their own questions, that the storyteller agents were only able to answer limited set questions. It is not possible to know for certain if the limitations of the questions system were due to limited question repertoire size or the keyword matching technique used to match user questions to storyteller agent responses. But, it is worth remembering that despite its imperfections, the inclusion of questions did not significantly *decrease* enjoyment. Despite the negative qualitative feedback, participants who experienced questions still enjoyed the prototype as much than participants who could not ask questions. Therefore, we believe that improving the question implementation could very likely result in significantly greater enjoyment levels. Questions also did not affect the extent to which participants felt like they were listening to real-life oral storytelling. Again, the fact that the storyteller agents could not answer so many questions most likely detracted from how real their narrations seemed. We revisit storytelling realism in Section

9.2.3 below where we discuss possible reasons for why it was not impacted by either questions or exchange structures.

Actual Interaction with Questions:
Studies Two and Three's usage logs showed that participants actively engaged in question interactions inputting a mean of ten questions over the course of five narratives, from which we might infer about two questions per narrative. However, the distribution of questions entered was significantly skewed and peaked such that most participants entered less than ten questions and a significant number entered between nine and ten questions. Nonetheless, most participants entered numerous questions and rarely opted out of entering a question and only allowed question opportunities to timeout a few times, on average. So, overall, the usage logs suggests that the main elements of our question design, namely the virtual hand-raising, allowing questions during narratives and the use of question opportunities, were effective in gathering questions from users. That there were no real differences between the numbers of during-narrative questions and question opportunity questions imply that they were equally effective at eliciting user questions.

Study Four's usage logs showed an average of two questions entered per museum visitor. Taking into account that visitors listened to an average of just over one narrative, this also amounts to two questions entered per narrative. However, this average is misleading because, again, the distribution for number of questions entered was significantly skewed towards lower value and peaked with significant number of participants entering between zero and one question. In fact, a small number of museum visitors input many more than two questions, while about 48% of visitors input no questions at all. Shedding further light on this was the finding that age was a significant predictor of the number of questions entered: younger museum visitors entered significantly more questions. The majority of museum visitors were older (the mean age was 32) which explains why, overall, the number of questions was so low. From this we conclude that older users were interested either in interacting with the prototype or in inputting questions. We revisit the role of age in Study Four again in Section 9.5.4. We also discovered another significant influence on the number of questions entered: visitors who experienced the version of the prototype which presented two narratives in a predetermined order and then allowed users to use story objects to trigger three more narratives (*PO* condition) entered more questions than those who experienced the version with only story object narratives (*O* condition). However, it is worth noting that this effect, while was significant, was small – *PO* condition visitors tended to enter about one question more than those in the *O* condition. So, this effect, most likely, does not indicate that combining pre-set narratives and story objects led to *marked* increase in number of questions. Furthermore, Study Four's visitors also rarely opted out of inputting a question and only allowed question opportunities to timeout a few times (mean = 2). However, regarding this latter finding, it is useful to bear in mind that many participants listened to less than one complete narratives, which means they would not have experienced any question opportunities (which all came at the end of narratives).

Unanswered Questions and Hints:
Usage logs in Studies Two and Three revealed a notable flaw in our question implementation: the storyteller agents were unable to answer 65% of participant's questions. While one in three questions being recognised and answered is not very poor for an automated system, our question implementation had certainly not fared as well as we had hoped. While providing keyword hints for

questions that the agent could answer was useful, it also revealed, to users, the limited nature of the storyteller agent's question repertoires. These flaws, no doubt, adversely affected participant's experience. Earlier we posited that this might have prevented questions from increasing participants' enjoyment. Furthermore, 42% of those who experienced questions singled them out as something that they did not enjoy, often citing the storyteller agent's inability to answer their questions and their limited question repertoire. Discovering that the prototype performed poorly at recognising input questions gave us insight into how participants likely experienced questions and pointed us towards the prototype's most needed improvement. During implementation, when we chose questions to include in the prototype, we assumed that users would ask questions that were similar to those that arose during tours at the museum and that related to the prototype's five narratives. Instead, they entered a broad variety of questions which often did not only relate to the narratives, but to forced removals and Apartheid in general and, very often, to the storytellers themselves. For example, many participants asked how old Joe and Noor were during the forced removals and where they moved to after leaving District Six. The storyteller agents responding "I don't know" to questions such as these must have seemed particularly incongruous, and was criticised in a number of participant's comments.

For Study Four, we attempted to improve on the prototype's question answering capabilities by increasing the storyteller agents' repertoires. We also ensured that many of these new questions related to Joe and Noor themselves. There we noted a 52% rate of unanswered questions – while still high; this was an improvement of 13%. Here, it is also useful to note that museum visitors entered few questions overall, so the question-answering capabilities was not as thoroughly tested as we would have liked. Testing it complete requires a larger study in which many questions are entered. Qualitative feedback indicated that questions were still problematic, but there was less criticism than in Studies Two and Three. Further improvement on question likely requires, not only expansion of the question repertoires, but also a more sophisticated implementation, beyond the simple keyword matching algorithm we used.

As mentioned earlier, many participants in Studies Two and Three reported feeling constrained to only asking certain questions. This perception was most likely a combination of the storyteller agents being unable to answer a number of their questions as well as the keyword hints. The hints were intended to steer users toward questions in the storyteller agents' repertoire and were displayed after if the user took longer than five seconds to type their question. The latter design decision assumed that users taking a while to enter their question might need assistance formulating a question. On the one hand, the hints helped participants enter answerable questions. But, based on qualitative feedback, they also revealed the agents' limited question repertoires and lessened the sense that users were free to ask any question they wanted. Using the hints, participants often resorted to entering questions that differed from initial questions they entered. That is, they were unable to enter the questions they really wanted to ask. Some even entered only the keywords themselves, rather than full questions, which was not how we intended the hints to be used. Ideally, the question design should have created the impression that users can ask any question, while providing a hints only if the user wanted help. In this regard, our results suggest that our design needs improvement. Perhaps, the decision of using keyword hints displayed after a time delay was not the best choice. A possible improvement would be to leave the question input box free of any hints, but provide an option (via a key press) which allows users to view a list of fully-formed

questions from which they can select the one they would most like to ask. Another option might be to allow users to enter their question and then present them with a list of questions from the storyteller agent's repertoires that match their question best and allow them to select the question closest to their intended question. We believe that questions, as a digital storytelling interaction has great potential, despite its flaws our design showed real success in producing and effective story experience as well as indicating a number of interesting directions for improvement.

9.2.2. Exchange Structures

Exchange structures were slightly more successful then questions and almost completely fulfilled our hypothesis that they would improve story experience. We believe that building the results of Study One and Sinclair & Coulthard's (1975) understanding of real-life exchanges allowed us to produce and effective and robust interactions for digitals storytelling. Still, the usage logs and qualitative feedback results suggested ways in which their design might be further improved.

Effect on Story Experience:

In Study Two exchange structures increased every story experience variable, except for storytelling realism. In terms of interest, we believe interacting with the storyteller agents predisposed participants to the idea of seeking out dialogue about the narratives beyond their experience of the prototype. Additionally, where participants were unable to answer questions posed by the storyteller agents, exchange structures might also have highlighted topics they did not know a lot about, leaving them with an interest in pursuing more information. The inclusion of exchange structures also led to significantly higher enjoyment. Again, we believe that being able to interact with the storyteller agents functioned to make their narratives more enjoyable. In the previous section, we proposed that questions failed to increase enjoyment because storyteller agents responded with "I don't know" to almost 65% of user's questions. This response also led to the end of a question interaction. Meanwhile, exchange structures were more robust: when a user's input was not recognised, the storyteller agent was still able to give a response, such as "No" or "No, try again", which made sense and allowed the interaction to continue. This would explain why, despite the fact that almost 55% of participants' answer attempts were not recognised by the storyteller agents, exchange structures still increased enjoyment. The increase in engagement was, as with questions, mostly likely due to presenting users with a way to interact with the storytellers and, thus, focusing their attention on the storytelling. After the first couple of exchange structures, most users would most likely realise that they needed to focus on the storytellers in order to hear any questions they asked. Additionally, the answers to some of the exchange structures were contained in the preceding narration. Once users realised this, it might have made them more inclined to pay attention to the storytelling to absorb any information that would be required to answer a forthcoming question. In fact, a few participants commented that exchange structures were successful in holding their attention or keeping them "alert". Overall, we feel that exchange structures were effective in boosting enjoyment and engagement because it was a simple, structured interaction with a clear pattern of turn taking between the storyteller agents, user and virtual audience. Exchange structures did not, however, affect how real the prototype's storytelling seemed. This was surprising since we felt that our design mimicked real-life exchange structures closely. We will address this finding later, in Section 9.2.3.

Actual Interaction with Exchange Structures:

We aimed to design exchange structures so that their use would be intuitive to and would allow users to enter answers to the storyteller agent's initiating question. Study Two and Three's usage logs suggested that participants interacted successfully with them. On average, there were 1.7 attempts to answer each of the seven exchange structures, with only 0.5 input cancellations. Furthermore, participants were able to provide the terminating answer for four exchange structures. The seven exchange structures presented different types of questions and levels of difficulty. Some tested pre-existing knowledge, for example, the exchange structures dealing with Cape Town townships. The answers for others were easier, in some cases obvious, as they had been alluded to or outright mentioned in the preceding narrative. For example, the exchange structures where the Noor agent asks about the races of the multi-racial couple in the *Group Areas and Mixed Marriages Acts* narrative and where the Joe agent asks about the consequences of asbestos used in township housing. Others could be answered using common sense, such as the exchange structures where the Noor agents asks the user to guess what his Apartheid-era race classification was given some family tree information and, again, to name the emotion he experienced upon watching the demolition of his District Six home. The fact that participants were able to provide the terminating answer for 60% of the exchange structures suggests an effective mix of difficulty in the initiating questions. If all the exchange structures had tested pre-existing knowledge a user did not have, participants would most likely have been discouraged from partaking in them.

The museum visitors in Study Four participated less readily in exchange structures with an average of 0.7 answer attempts and 1.5 input cancellations per exchange structure. Here, it is useful to bear in mind that Study Two and Three's participants experienced seven exchange structures while Study Four's museum visitors experienced far less of the prototype's content, since they were free to abandon the prototype at any point. Ultimately, the museum visitors experienced one narrative on average and, in turn, far less of the exchange structures. Depending on the story they experienced, they might have been presented with anywhere between one and four exchange structures. On average they input the terminating answer for only 16% of the exchange structures they experienced. Unsurprisingly, South African visitors were able to answer significantly more exchange structures than foreigners. Since many of the museum visitors were foreigners (of the 69 visitors who complete feedback forms, 19 were South African) many would not have been able to answer the exchange structures which tested pre-existing local knowledge. This may have discouraged them from partaking in future exchange structures.

As we have already mentioned in relation to questions, an interesting aspect of Study Four, was that there seemed to be extremes in the amounts of interaction museum visitors evidenced. Our observations suggested that they either interacted very actively with the prototype or very passively, even sitting with hands away from the keyboard. Thus, averages may not be a useful for gleaning typical levels of interaction with exchange structures. This is particularly true in the case of cancellations where there was a high standard deviation indicating high variation across visitors. Again, our observations suggested that there was a tendency for visitors to either opt out of responding to exchange structures repeatedly or input an answer attempt at every opportunity. As with questions, we found that age was a significant predictor of the number of exchange structure inputs such that younger visitors showed significantly more active interaction than older visitors. We will revisit this finding in Section 9.5 below.

Unrecognised Answer Attempts:

Usage logs showed that the storyteller agents did not recognise 55% and 69% of users' answer attempts in Studies Two and Three and in Study Four, respectively. This was not too surprising since four of the seven exchange structures were only able to recognise one answer (the terminating answer). Nonetheless, it was never our aim to have the storyteller agents recognise all user inputs specifically, but rather to equip them with *some* input-specific responses. Our ability to create input-specific responses additionally restricted by our audio recordings of Joe and Noor such that the storyteller agents were only able to respond to answers that had arisen in the tours we had recorded during Study One. The proportion of unrecognised inputs was further increased by spelling. Even though, we tried to account for a variety of misspellings, participants entered spellings that we had not anticipated. In particular, some used 'text message style' abbreviations, for example, using "u" instead of "you" or "wud" instead of "would", which also resulted in their inputs not being recognised. Even when we tried to increase the number of misspellings the agents could still recognise in Study Four. Rather than anticipate a range of possible misspellings, a more effective change would be to make use of "fuzzy" word recognition which would allow words to be recognised even if a number of a letters are incorrect.

Allowing the storyteller agents to recognise, and hence give specific responses to, a wider of inputs would probably increase how real they seem. However, we feel what would be more useful to have an increased selection of storyteller agent responses that can used when incorrect answers are entered, even if input answers aren't recognised. This way, the agents wouldn't respond to all incorrect answers with the same default "No" or "No, try again" responses that we used in our prototype. It would be better to have the agents respond with a slightly different response each time the user enters an incorrect answer – ones that use varied wording to both encourage more answers and hint at the correct answers.

A further, particularly notable, example of unrecognised inputs were the handful of cases where participants attempted to convey that they did not know the answer to the initiating question, by inputting, for example, "I don't know". However, the storyteller agents did not recognise this input and continued to prompt the user for answers. A preferable response to such and input may have been to either provide them with hints towards a correct answer or allow them to opt out of answering the exchange structure altogether.

Potential Design Improvements:

While exchange structures were quite successful both in their effect on story experience and how most users engaged with them, we believe there is room for improving their design even further. A few participants pointed out some aspects of exchange structures that detracted from their enjoyment. Some participants noted that exchange structures were not enjoyable when they did not know the answer(s) to the initiating question, yet were continuously prompted to enter answers. As we pointed out in the previous section, allowing the users to indicate that they did not know an answer would be a useful option to add to the exchange structure design. Other participants pointed that they did not always hear the initiating question, which was frustrating as they did not know what question they were being prompted to answer. We did not anticipate that users would not hear initiating questions and this flaw could be fixed in one of two ways: (1) Give users the option to repeat the question and/or; (2) Instead only encouraging users to attempt to answer an exchange

structure, the storyteller agents could also, occasionally repeat the question as part of their encouragement. For example instead of saying “No, try again”, they could occasionally say “No, try again. Try to guess what race the Apartment government classified me as.”

A further potential improvement arose from observing a repeated pattern of use over the course of Studies Two, Three and Four. The prototype allowed users to press the Escape key to opt out of supplying an answer. This would result in a virtual audience member supplying an answer. After this the storyteller agent would again prompt the user to an answer. We chose this design because we hoped that hearing the answers offered by the virtual audience would encourage the user to enter their own answers. We also wanted to give the user as many opportunities as possible to partake in the exchange structures. To this end, our design also ensured that, where possible, virtual audience answers were non-terminating so that their answers would not lead to the end of the exchange structure before the user had a chance to attempt an answer. So, only if there were no unused non-terminating answers, would the virtual audience supply the terminating answer. However, we often observed that when users opted out of answering and exchange structure once, they tended to opt out of all the subsequent opportunities to answer as well. This led to the unintended situation of users repeatedly pressing Escape in order to move the exchange structure along. In the case of users who attempted to indicate that they did not know the answer we observed that after having an “I don’t know” input go unrecognised one or two times, participants also repeatedly pressed Escape to opt out of inputting answers. Rather than leading to users participating in the exchange structures, this pattern of use resulted in the virtual audience running through all the available non-terminating answers before reaching the end of the exchange structure. It would be interesting to test whether this situation arises if the storyteller agents give more hints at correct answers. Even though, we observed users attempt to repeatedly opt out giving exchange structure input, we predict that giving them the option to opt out of answering entirely would encourage users to, in effect, skip over exchange structures rather than encourage them to partake in them. So, an overall improved exchange structure design could allow users four possible actions, the two we used in our prototype and two additional actions. That is: input an answer; opt out of answering once; input or select an “I don’t know” option which would lead to the storyteller agent giving specific hints; and request that the initiating question be repeated.

9.2.3. Storytelling Realism

An important aspect of our research approach was to draw design inspiration for digital storytelling from real-life storytelling. We based our design for questions and exchange structures on the real-life interactions we observed between guides and audiences in Study One. Therefore, we expected they would be reminiscent of interactions users might expect to have with real storytellers and, hence, make the experience feel more like real-life oral storytelling. But, in Study Two, neither questions nor exchange structures had an effect on how real the storytelling seemed. Participants who did not experience any interactions found the storytelling as realistic as those who were able to interact with the storyteller agents. So either, the designs was not sufficiently realistic or some other factor(s) were at play. We have already mentioned that the fact that the storyteller agents were unable to answer many participants’ questions most likely compromised how real the question interactions seemed – particularly with personal questions that one would expect the storytellers to know the answers to. Reflecting on exchange structures, however, we could not discern why they did not increase storytelling realism. Particularly since they were so successful in both improving all the other aspects of story experience. The fact that neither questions nor exchange structures

affected storytelling realism, led us to consider and over-arching reason for why interacting with the storytelling agents in general did not make the storytelling more realistic.

One could argue that the use of a low-fidelity desktop VE and interacting with the storyteller agents via keyboard and mouse reduced the overall realism. However, we know this is not the case when we look at the storytelling realism scores. Like the scores for all of the story experience variables, storytelling realism scores were significantly clustered around higher values. So, most participants, regardless of experimental condition, rated the storytelling as highly realistic.

One possible reason for the high storytelling realism scores and the lack of effect on storytelling realism could be the questionnaire. The storytelling realism items asked participants to rate how much the storyteller agents seemed like "real people" and how "realistic" and "real-life" the storytelling seemed. It is possible that participants did not quite interpret these items as we had intended: rather than interpreting them as rating whether the *storytelling* seemed real, they may have rated whether the *narratives themselves* seemed to be those of real people. Since the storyteller agents clearly told narratives about real events, they would obviously be judged as true stories. In the case of the latter, future work should seek to make the wording of questionnaire items seeking to measure storytelling realism make a clearer distinction between rating the realism of *storytelling* vs. rating the realism of *narratives*. A second reason could be the storyteller agent's realism regardless of the interactions. For instance, since the soundtrack was composed of recordings made during real tours led by Joe and Noor, they captured a lot of the style, tone and content of their storytelling performances. We strongly believe that the quality of their voices and narrative content itself made, even the non-interactive versions of the storyteller agents compelling such that they were perceived as "realistic" or "real" people.

9.3. Story Objects as Narrative Triggers

Study Three tested for the effect of using story objects to trigger narratives and allow users some control over the order in which they experienced a collection of narratives. We expected that using story objects would improve story experience, but found, conclusively, that they had no effect on story experience. Despite this, we did find that the use of, both interactive and non-interactive, picture objects related to the narratives was very popular amongst users. We included picture objects in our VE because they are important aides in Joe and Noor's storytelling at the District Six Museum. While their stories don't rely on them, they do concretise key parts of their narratives, for example what Joe and Noor's former homes looked like. Almost half (49%) of participants in Study Two and Three, identified the picture objects as something they liked (without distinguishing between interactive and non-interactive pictures). Some comments revealed that participants liked the visual elaboration the pictures provided. A much smaller percentage (17%) of those who experienced the interactive story objects identified them as something they liked. A handful of participants (9%) singled out the Richmond Street panel, which was scripted to move and swivel at a particular time during Joe's *Richmond Street* narrative, saying that it was compelling. Observing the reactions of participants during this narrative and noting comments we received regarding Richmond Street, it seems that the virtual panel aptly captured the impact of the real-life panel as used during Joe's tours. It also indicates potential for adding this kind of scripted movement to other objects associated with the narratives being told by storyteller agents. For example, since, some

participants complained that they could see the pictures clearly enough, perhaps a picture could be scaled up when being referenced by a storyteller agent.

In Study Four we compared a version of the prototype which combined pre-set narratives and narratives anchored in story objects (*PO* condition) and a version with only story object narratives (*O* condition). We found that the latter resulted in a significantly longer time spent at the exhibit. This finding suggests that story objects improved story experience in a way that kept museum visitors engaged for longer. However, while this effect was significant, it was also small: In the *PO* condition, visitors listened to about 1.1 narratives, while *O* condition visitors listened to almost 1.6 narratives. Firstly, this tells us that most visitors experiencing the *PO* version did not get past the first two, pre-set narratives and, hence, did not experience the story objects. Secondly, it suggests that visitors in the *O* condition listened to about half a narrative more. Since *O* condition visitors got to choose which narratives they heard right from the start of their experience, they may have been more invested in listening to more of their selected narratives. The fact the *O* version resulted in visitors completing half a narrative more is neither trivial nor major. While they were successful in getting visitors to spend longer at the exhibit, they were not enough to make visitors stay for two or more complete, narratives.

9.4. Overall User Response in Studies Two and Three

In this chapter, we have already covered how participants in Studies Two and Three reacted to interacting with the storyteller agents (see Section 9.2) and story objects (see Section 9.3). But, we were also able to gather a sense of how they felt about other aspects of the prototype and their experience as a whole. In this section we recount their overall reaction to experiencing Joe and Noor's stories in a VE. We will reflect what these reactions tell us about presenting personal narratives digitally and the successes and downfalls our prototype.

9.4.1. An Unexpectedly Positive Response

In Studies Two and Three the response to the prototype as a whole was overwhelmingly positive – scores for all the aspects of story experience were all significantly clustered around higher values and the qualitative feedback was overwhelmingly, and surprisingly, complimentary. Also, while using the prototype, participants exhibited behaviours, such as laugher and exclamations, which strongly suggested that they were engaged in, and enjoying, the experience. This is not to say that every participant liked the prototype – a minority exhibited boredom and difficulty with some interactions. Finally, it was commonplace for participants to approach the experimenter after completing the experiment to find out more about the project and inquire into the prototype's future availability. This implies that numerous participants were interested in experiencing more narratives if the prototype were to be available to the public. That is, they exhibited an interest finding our more about District Six, which was one of our story experience goals.

The positive reaction of participants, in particular the very high story experience scores do, however, also suggest the possibility that participants were biased in some way. We posit that there were three possible sources of bias, all of which we believe we counteracted as effectively as possible. First, advertising the study as a "District Six Storytelling Study" may have attracted a sample predisposed to react favourably to content on District Six and/or storytelling. In general, we got the

impression that participants signed up primarily for the payment and secondarily out of interest in District Six stories. We have already described how we measured and controlled for participants' tendency to show interest in South African history and personal narratives and their pre-existing knowledge of District Six and Apartheid (see Section 9.1). Indeed, participants scored very high for both of these confirming that the sample was prone to responding positively to our prototype's content. Furthermore, all our analyses controlled for the participant's interest tendency. Second, participants' enjoyment of the narratives' content alone could have biased them to reflecting an overall positive impression. This is more commonly referred to as the halo effect – a positive impression of one aspect of an application, such as its aesthetics, can lead to a positive judgement of other, unrelated aspects, or the application as a whole, even if they are of poorer quality (De Angeli, et al., 2006). In our work, it is possible that the narratives themselves were enough to ensure a very positive story experience; we discuss this further in the next section. Third, it is possible that the novelty of experiencing an interactive VE caused participants' positive response. A number of studies on posit that participants may respond positively to VR applications because of their novelty, as opposed to their particular design (Johnson, et al., 1998). However, we used low-fidelity VR, which should not have been novel to most users. Particularly given that Study Two and Three's sample was likely to have had some exposure to desktop computers and 3D video games. If any of these biases were present in Studies Two and Three, they may have boosted story experience scores and how favourably participants reacted to the prototype explaining the very positive overall response we saw. However, since they would have been distributed across the whole sample, they would not have affected comparisons between the experimental conditions.

9.4.2. The Narratives Themselves Stood Out

Most qualitative feedback consisted of positive comments about the narrative content implying that the narratives themselves left the greatest impression. To us, this was a very positive outcome, since our overarching goal was to explore effective ways of conveying personal narratives. Since the narratives stood out most, we feel the prototype was successful in this regard. Participants reported that the narratives were emotional and informative. They were especially struck by the fact they were personal narratives and imparted a sense of gratefulness that South Africa overcame Apartheid. Others related personally to the narratives because earlier generations of their own families experienced forced removals or because they themselves lived in the townships created by the Apartheid government. Some participants pointed out that the narratives were, at once, compelling, sad and painful to listen to. The storyteller agents themselves were also popular, namely their perceived personalities and how they told their stories. In fact, our questionnaire asked participants in Studies Two and Three to choose their favourite storyteller agent and narrative. The aim was to see if their choices and reasons suggested preferences for more, or less, interactivity since the Noor agent's narratives featured more interactivity[21]. Instead, almost all participants picked favourites according to the stories they found most memorable or compelling, and not interactivity. Similarly, favourite storyteller agents were selected based on preferred tone, style or personality. Only a very small handful chose favourites based on interaction – all of these indicating

[21] In Studies Two and Three, the Noor agent could answer six possible questions, whereas the Joe agent could answer three. And six of the prototype's seven exchange structures occurred in the Noor agent's narratives. We did not create this distinction between the storyteller agents purposefully. Rather, it occurred naturally based on the recordings Noor and Joe's storytelling; as we noted in Study One, Noor tended to be more interactive during tours than Joe.

that they preferred more interaction. For instance, one participant stated that the Noor agent's interactivity created more of a "relationship" with the user and virtual audience.

9.4.3. Experiencing Narratives in a Virtual Reality

A number of participants felt that the prototype presented a welcome alternative to experiencing these kinds of stories through reading or a museum. Some participants, who had visited the District Six Museum, said their experience of the prototype resonated with their experiences there and suggested that prototype be a good addition to the museum. While, it was certainly not our intention to replace books or, especially, visiting the District Six Museum itself, this indicated that participants were excited about experiencing narratives in an interactive VE. Almost a quarter of participants liked the virtual space itself, citing its atmosphere, aesthetics and audio. As mentioned earlier, almost half of the participants liked the pictures while a further 19% enjoyed using the keyboard and mouse to interact with the VE. Only a small group of 7% did not like certain aspects of the controls, for instance the mouse sensitivity or the navigation controls. A small group alluded to feeling present in the virtual room as if it were a real place. On the one hand, we aimed to make the room reminiscent of the real District Six Museum, so this suggested that we achieved that goal. On the other hand, we kept the room very simple so that the focus would be on the storyteller agents and pictures. The fact that some responded to it as feeling real suggests that the simple textures and compelling audio went a long way in making it a convincing space for some; a few even mentioned that its simplicity helped them focus on the storytelling. A small proportion of participants (19%), however, found the room too sparse. This tells us that, for future refinement of the prototype should aim to make the room more aesthetically pleasing *without* detracting from the storytelling.

9.4.4. Critical Feedback

While the overall response to the prototype was positive, we also received some negative feedback. Our questionnaire encouraged participants to note what they liked *and* disliked and, as a result, the qualitative feedback provided numerous, useful criticisms. We have already discussed the, mostly negative, feedback regarding the question interaction in Section 9.2.1 and the critical feedback on exchange structures in Section 9.2.2. Most of the other negative feedback dealt with the implementation quality, most prominently: the quality of the audio, models and animations. This was hardly surprising since the VE was a prototype focused, not on aesthetics, but creating interactive digital narratives. Apart from questions, the main things that participants disliked turned out to be aspects of the VE that we knowingly compromised on as they were secondary to our research goals. For instance, 25% of participants disliked the variable audio quality, which resulted from using recordings, gathered for Study One, from a range of real tours at the District Six Museum. When we gathered these recordings, we did not expect to use them for the prototype. However, we realised that they had the potential to facilitate a faithful translation of Joe and Noor's storytelling to our VE. Time constraints prevented us from carrying out the extensive audio editing or, re-recording the same range of material from Joe and Noor directly. About 19% of participants thought the "graphics" quality was poor. Mostly this meant that virtual storyteller and audience models did not look or move very realistically. A number of participants disliked the fact that the virtual audience was small and comprised of identical avatars. Once again, this was a compromise we knowingly made as the appearance of the virtual audience was secondary to our research goals. A further 19% of participants criticized the virtual room, because it was too sparse and was closed off with no windows or doors leading to more space to explore. Regarding the latter point, having the

storytelling take place in a closed room was a conscious decision as we wanted to ensure that users would not move too far away from the storyteller agents.

9.5. Overall User Response at the District Six Museum

Studying interactive displays in musuem settings is certainly not novel, and we were not expecting to make generalised observations, but were interested in exploring how real museum visitors reacted to our prototype specifically and explore its use in a public setting, like the District Six Museum. Also, since we were introducing interactive digital storytelling to a museum that had never used interactive exhibits, we were interested in the staff's reactions.

9.5.1. Mixed Reviews

The overall reaction in Study Four was not as clear cut; there were indicators of both positive and negative responses from museum visitors. We asked visitors to rate, from 1 to 7, their interest, enjoyment, engagement and how real the storytelling felt. Their ratings actually mirrored the story experience scores of Studies Two and Three: they were all significantly non-normally distributed, showed some skew towards the upper end of the scale and, with the exception of engagement, were significantly clustered around higher values. Even though engagement did not fit this pattern, ratings were still fairly high showing a mean of 5.4 while the other ratings' means were closer to 6. Since participants for this study were visitors to the museum, we can assume that they were already interested in finding out about District Six and forced removals. Thus, we cannot be sure that their high interest ratings were a result of our prototype[22]. However, they did report very high enjoyment and fairly high engagement with the prototype's narratives, and perceived the storytelling as realistic. Additionally, much of the qualitative feedback was very complimentary indicating enjoyment of the narratives, interactions and VE. A few comments stated that the prototype could substitute for Joe and Noor at times when they are unavailable to give tours in person. Since our intention was to capture Joe and Noor's real-life storytelling, this feedback was particularly affirmative. Another notable comment came from a young child who said that the experience seemed like a classroom lesson; we felt this reflected the way Noor and Joe tell their stories and fact that our interaction design was guided by Sinclair and Coulthard's (1975) work on teacher-student interactions. Much like the participants in Studies Two and Three, many comments focused on the narratives themselves saying that they were touching and enjoyable.

Despite this positive feedback, usage logs and close observation of visitors to the exhibit gave us insight into their actual engagement with the prototype. One of the first negative observations we made was that numerous visitors only stayed at the exhibit long enough to listen a small proportion of the content. On average, they completed less than two, out of the five, narratives. Additionally, older visitors tended to approach our exhibit more hesitantly and when seated in front of the display, listened passively. In fact, we routinely observed them sit with their hands away from the keyboard and mouse, touching the keyboard only to opt out of exchange structures. On the other hand, children, teenagers and young adults approached the exhibit readily, interacted actively with the storyteller agents and more often exhibited behaviours that suggested engagement and

[22] In Study Four we did not measure interest tendency or existing knowledge since we were not aiming to conduct any statistical analysis with the story experience ratings, but rather glean an overall idea of the museum visitors' story experience.

enjoyment, such as laughing or out-loud reactions. Some young children and teenagers even appeared impatient during stretches of non-interactive narrative resorting to constant navigation and button mashing rather than listening to the narratives. We discuss the extent to which visitors interacted with the storyteller agents further in the next section.

9.5.2. Interaction with the Storyteller Agents

We have already discussed how museum visitors used questions, exchange structures and story objects (in Sections 9.2.1, 9.2.2 and 9.3, respectively). We observed numerous visitors use the prototype in the way we had intended – listening attentively to the narratives while periodically partaking in interactions and. But, we were also aware to two extremes: for many older visitors the prototype required *too much* interaction, while there was *not enough* for children and teenagers. Statistical testing further showed that age was a significant predictor of the number of question and exchange structure inputs with younger visitors inputting significantly more of both. Since Study Four's sample was made up of more adults (the mean age was 32), passive engagement with the prototype was more predominant. In Studies Two and Three, interaction with the storyteller agents, which was more active in general, was not affected by age. This is probably due to the fact that most of Study Two's participants were young adults (the mean age was 21).

There are a number of possible reasons the effect of age on amount of interaction. It is possible that older visitors were not at ease using the prototype due to having less experience using computers or interactive VEs compared to younger visitors. Certainly, the hesitancy with which older visitors approached our exhibit suggested an uncertainty about using the computer. Furthermore, we often observed visitors leave the exhibit during or after encountering their first interaction, usually an exchange structure, with one of the storyteller agents. This strongly suggested that the first interaction put some visitors off the rest of the experience, perhaps since it created the impression that there would be a lot of forthcoming interaction. Comments from older visitors revealed that they saw these interactions as interruptions to the narratives. A few stated that they would have preferred listening to uninterrupted, non-interactive narratives, with one visitor suggesting that this would have been "more suitable for adults". The latter comment implies that older visitors may have seen an interactive digital storytelling experience as being more appropriate for young, or more modern, visitors. Following on from this, it is also possible that older visitors saw other people using the prototype and developed the impression that it was a video-game intended for young visitors. This perception could also have been a consequence of the prototype's content and design. The audio used for the Joe and Noor agents was mostly recorded during tours with school groups. Consequently, Joe and Noor's tone may have reflected that they were talking to children. The design of user-storyteller agent interactions was, also, inspired by tours with, mostly, school groups and refined via Sinclair & Coulthard's (1975) work on teacher-student interactions in classrooms. Thus, it was not surprising that the storyteller agents' tone and interactions had the flavour of a classroom lesson. One young visitor in Study Four, in fact, commented that their experience felt like a real lesson. While this did not really arise in Study Two and Three, one participant there did comment that it felt as though storyteller agents were speaking to children. The fact of the matter is Noor mostly speaks to audiences of young children, while Joe routinely addresses older student groups. Their style has been adapted for these, predominant, audiences and does not vary much when

addressing adult, non-student audiences[23]. The fact that the prototype's tone and interactions seemed aimed at young audiences is, therefore, a translation of what Joe and Noor's real-life styles.

A few older museum visitors told us that they were expecting the exhibit to play videos of District Six ex-residents. One visitor told us that she wanted a break from all the information in the museum and hoped that our exhibit would offer a passive experience. Even though multi-media, technology-based, even interactive, exhibits are not a novelty in South African museums, they are hardly common-place; there are few precedents for what to expect from these kinds of exhibits. Our experience suggests that visitors of varying ages had different expectations, or preferences, of an exhibit presented on a desktop computer: older visitors seemed to expect a passive and static video viewing, while very young visitors appeared to desire a constantly interactive video-game. While our prototype aimed to provide a balance of these, it was not possible to cater to both the desire for no interaction and constant interaction, resulting in dissatisfaction for many.

9.5.3. The Use of Introductory Slides

We wished to the test the prototype as a standalone exhibit, thus, we needed to provide some way to both introduce what the exhibit was about and prepare visitors for using the prototype successfully. To this end, we used a set of slides, displayed on the computer screen, which users could click through to read before the prototype would load automatically. We believe the first slide, which displayed photographs of Joe and Noor, attracted a good number of visitors to the exhibit. But, at the same time, quite a few visitors (20 out of 113) did not click through all the slides and continue on to the prototype. It may be that these visitors did not want to read all the slides or they were put off by the amount they needed to remember to use the prototype. We also observed that some visitors did not read the slides carefully, which led to them requiring help, usually with getting the prototype started. Visitors who did not read the slides thoroughly may also have been ill-equipped for subsequent interactions with the storyteller agents. Overall, most visitors who read the slides appeared adequately prepared for using the prototype successfully.

Recall that overall levels of interaction in the prototype were quite low. We believe this was most likely due to the fact that most visitors to the exhibit were older adults (as discussed in Section 9.5.2 above). The introductory slides may also have played a role. Studies Two and Three's training included in-person instruction and opportunities to practice each control and interaction. It is quite possible that training by reading the slides was not sufficient for visitors with less computer experience; being able to practice interactions may have allowed them to use the prototype more confidently and successfully. Indeed, a small number of participant's comments stated that the prototype was difficult to use. Practically speaking, the in-depth training, used in Studies Two and Three, would have made it easier to interact with the VE and storyteller agents. Additionally, it could have predisposed them to higher levels of interaction than in Study Four, by creating an impression that this interaction was an expected aspect of their participation in our study.

It may prove more effective to provide an introduction in a VE such that users were given context, explanation of the controls and an opportunity to practice them. This could take place in a virtual

[23] The only real changes we noted with non-student audiences were in Noor's tours: he tends not to use as many exchange structures, particularly avoiding those that play out as guessing games, and, with foreigners, he avoids exchange structures which test local knowledge.

room which later leads into a room containing the storyteller agents, or could take place in the same room at the storyteller agents with text instructions, or, even using the storyteller agents.

9.5.4. Placing the Prototype in a Public Setting

Deploying the prototype in a public setting presented us with a number of unexpected situations and usage scenarios. Most we had not anticipated and, in retrospect, they were clearly outcomes of being in public museum. Hence, Study Four brought a number of crucial considerations to light regarding any future development of the prototype into an effective museum exhibit. When we designed the VE we envisioned it as a single-user experience to which museum visitors would react as though they were part of one of Joe or Noor's tours. That is, we hoped that they would readily and intuitively interact with the storyteller agents and where they would be in engaged enough to listen to most of the content. Unlike the experimental setting of Studies Two and Three, the museum visitors were able to leave the prototype whenever they wanted and, overwhelmingly, we saw that they only listened to a small proportion of the available content. Listening through all five narratives took between 20 and 30 minutes – a fairly long amount of time. We certainly did not expect all visitors to listen to all the content. But, we were disappointed that most stayed for little over one narrative. This would almost never happen in a real tour as disengaging from a real-life storyteller would be socially inapproapriate, especially for the organised tour groups we observed in Study One. Evidently, this social context did not translate to a digital storyteller agent making it easier for visitors to leave in middle of virtual tour (Ladeira & Nunez, 2007). Indeed, some visitors appeared to leave the prototype because they had heard enough or they did not wish to partake in the interactions presented. But, often they left because they were called away by a tour group leader or companion or, even, their mobile phones. The museum is a space visited by organised tour groups who spend a limited time amount of time there (anywhere from 15 to 30 minutes). Furthermore there are numerous exhibits competing for their attention during this time. If our exhibit, correctly, gave the impression that experiencing all the available content would take up a significant amount of time, these visitors might have felt compelled to move on so that they did not miss out on the rest of the museum. For these visitors, we feel that listening to one story at our exhibit constitutes a reasonable amount of time spent there. The museum is also visited many foreign tourists, some of whom do not speak English who, naturally, left the exhibit upon realising that storyteller agents spoke only English. Nonetheless, we believe that the use of Joe and Noor's own voices is a big part of what made the prototype compelling. It would be difficult to support multiple languages without sacrificing the sound of their voices or resorting to subtitles.

A further unexpected, but quite common, situation was that, instead of one person using the prototype at a time, visitors often attempted to share the experience with each other. We regularly saw people pass the headphones to their companions or, even, attempt to engage with the protoype simultaneously. While we were happy that exhibit drew the attention of groups of visitors, these situations, most likely led to fragmented experiences of the narratives and confusion for second or third visitors who did not listen from the start or read the introductory slides. It was clear the the single-user experience we had designed was a mismatch for a setting visited by groups of potential users. Reflecting on this, we believe it would be better if many visitors could experience the prototype simultaneously. In the very least, this could involve one user controlling the prototype while others are able to listen via speakers. But ideally it would be a multi-user experience where the virtual audience we used could be minimised or dispensed with entirely and a group of real users

would make up the audience and all be able to move around the VE and interact with the storyteller agents. In this scenario, a number of users could up their hands to ask questions, exchange structures could allow users to put up their hands to signal the desire to answer a storyteller agent's question and each user could be given a turn to select a story objects. This would actually be a more direct translation of the tours we observed in the museum. An installation capable of presenting interactive narratives to many users simultaneously would not only be a truer simulation of real-life oral storytelling, but would also be more practical in a public setting. We predict that visitors would be less inclined to leave in the middle of a narrative if the experience was shared with others. The prototype we created for this project was successful in allowing us to test questions, exchange structures and story objects. However, the single-user experience is clearly not suitable for the District Six Museum and would be better suited to being placed online for private viewing. We believe that creating a collaborative multi-user experience is an ideal future direction for this work.

9.5.5. Digital & Real-life Storytellers

We had some trepidation about introducing our simulation of Joe and Noor's storytelling in the very setting where they actively tell their stories. Therefore, we were sensitive to the interplay between the prototype's storytelling and their real-life storytelling. We were pleased that digital and real-life storytelling did not clash and that the prototype was clearly not seen as an immediate replacement for Joe or Noor. The fact that both storytellers usually lead tours in the mornings did mean that in the afternoons, there was ample time for us to see how our exhibit attracted visitors in the absences of real tours.

We were also pleased that Joe and Noor were supportive of the prototype, directing visitors to it if they were unable to speak to visitors themselves. However, while they expressed favour for our work, neither was eager to try the prototype, usually saying that computers were "not their thing". In fact, Noor is well known at the museum for disliking modern technologies, such as mobile phones and computers. Our perception is that both resident storytellers were genuinely supportive of work aimed at preserving District Six ex-residents' narratives. But, regardless, they, much like many of the older museum visitors we encountered, felt that exhibits involving interactive technology were intended for younger audiences.

9.6. Summary

In this chapter we and discussed the results of Studies Two, Three and Four, each of which evaluated a different aspect of the design embodied by our storytelling prototype. Study Two tested the effectiveness of questions and exchange structures, Study Three the use of story objects and Study Four tested the prototype as an exhibit at the District Six Museum. Studies Two and Three took the form of controlled experiments in which our measure of effectiveness was *story experience*, a multi-dimensional construct consisting of: *interest* in finding out more about the narratives' context, *enjoyment* of and *engagement* in the storytelling and *storytelling realism*. We also considered factors that would be likely to affect them: *existing knowledge* of District Six and tendency to show the tendency to show interest in South African history and personal experience narratives (*interest tendency*). We created valid and reliable scales to measure all of these and found that all the aspects of story experience were significantly related to each other and interest tendency significantly influenced story experience. Our digital storytelling design had three main features: questions,

exchange structures and story objects. Exchange structures emerged as the most successful: it significantly increased interest, enjoyment and engagement; and usage logs showed that most participants in Study Two and Three used it successfully. But, we also discovered some promising ways in which the exchange structure design could be further improved. Questions also showed significant promise increasing interest and engagement. But, we believe a more sophisticated implementation featuring a much larger question repertoire than we used and an improved algorithm for recognising user's questions would produce and even more effective interaction. Story objects were the least successful; they did not affect any aspect of story experience. Nonetheless, qualitative feedback suggested that the presence of narrative-related objects was popular among participants and in Study Four, story objects positively influenced the amount to time museum visitors spent listening to the prototype's content. So while story objects as a means for triggering for narratives may not have proven successful, our findings suggest they might be useful in other ways (for instance as animated visual accompaniments to the narratives like the Richmond Street panel we used). In Studies Two and Three, the qualitative response the prototype was overwhelmingly positive and it was clear that the narratives themselves stood out and left an impression on participants. Participants also responded positively to the idea of experiencing storytelling in a VE with storyteller agents. In Study Four, the qualitative response was also very positive, but our observations and statistical analyses showed that older visitors tended to dislike the prototype's interactivity while younger visitors interacted with it more readily. Additionally, we found that our single-user prototype was often shared among many different users, suggesting that, as a public exhibit it would be better implemented as a multi-user experience.

Chapter 10
Conclusion

The work described in this dissertation was sparked by an interest in preserving real personal experience narratives in a way that simulated real storytellers. Our overarching aim was to work on novel digital storytelling design that would allow users to experience interactive and dynamic storytelling. We worked closely with the District Six Museum, which commemorates South Africa's Apartheid-era forced removals in which neighbourhoods were designated for particular races. They focus particularly on District Six, a mixed race neighbourhood in the heart of Cape Town from which residents were evicted and which was demolished to make way for a whites-only neighbourhood. They define themselves as a community museum which seeks out the input of a community of District Six ex-residents as much as possible. Their collections consist largely of objects donated by ex-residents and ex-residents participate in its daily running, organizing educational tours, working in archives, managing the museum bookstore and coffee shop etc. Particularly key to museum visitor's experience are two ex-residents, Noor Ebrahim and Joe Schaffers, who work as full-time guides and whom the museum considers as residents storytellers who convey their experiences of and perspectives on Apartheid and the forced removals. Unfortunately, the community of District Six ex-residents is aging and diminishing. Consequently, there are fewer ex-residents available to tell their stories in-person. The epitome of this problem is Joe and Noor themselves; when they depart from the museum, visitors will no longer be able to experience their storytelling. Thus, the museum wanted to explore ways in which the experience of hearing ex-residents' narratives first-hand might be captured – they wanted to preserve, not only the personal experience narratives of District Six ex-residents, but also the way they told them. This exemplifies a common cultural heritage preservation problem, namely presenting oral histories and personal narratives in a way that is true to the how these are passed on by real-life storytellers. In this chapter we review our work towards a digital storytelling design to preserve real storytelling such as Joe and Noor's. We used a multi-disciplinary approach which combined computer science, linguistics and discourse analysis, as well as combination of qualitative and quantitative methods including ethnography and controlled experimental studies. In Section 10.2 we itemise the contributions of this work to the field of digital and virtual storytelling. In Section 10.1 we summarise our research, pointing out our five research questions and their answers. Finally, in Section 10.3 we describe what we feel are the most interesting and promising future directions for this work.

10.1. Contributions of this Work

This project has made several significant contributions to the fields of digital and virtual storytelling and did so by effectively combining qualitative and quantitative methods.

Integrating Methodologies to Understand and Simulate Real Storytellers Effectively:

We demonstrate a new approach to studying and designing interactive digital storytelling. We began by conducting a thorough ethnography of real storytellers. Often when ethnography is used to aide

with technology or interaction design, it is the potential end-users that are studied. But, in our work, we were studying a real-life phenomenon (the storytelling of District Six ex-residents) we were hoping to simulate. We then used in-depth linguistic and discourse analyses to gain a comprehensive understanding of the structure, dynamism and interactions in their narratives. The results were used to develop novel digital storytelling designs which were rigorously evaluated, using two controlled experiments and an exhibit at the District Six Museum, to reveal which aspects of design were successful. Our research approach effectively integrated numerous disciplines to produce a successful digital storytelling design. This approach can be effectively used by other storytelling researchers given the opportunity to study naturally occurring real-life storytelling.

Designing Interactive Digital Storytellers using State Machines: Study One's qualitative findings were translated into a design with three foci: questions, exchange structures and story objects. We simulated these using state machine designs which allowed narratives to be defined as a series of clauses, questions and exchange structures. The state machine designs allowed users to participate in narratives, rather than listen to them passively. Additionally, we devised a way to incorporate anchor narratives to objects in the VE. We also used a series custom-format files to: define the narratives; script soundtrack and animations; define the question and exchange structure interactions; and story objects. Practically, this provided a flexible way to change this content without changing code or recompiling. This way of representing interactive narratives can be easily implemented and adapted by others (particularly if they, like us, are able to record real storytellers interacting with live audiences). We believe our results demonstrate the benefits of interaction design which imitates human-like dialogue, as suggested by Suchman (2007).

Evaluating the Efficacy of Questions, Exchange Structures & Story Objects: We proved that questions and exchange structures were effective for improving user's experience of digital narratives, as opposed to static, non-interactive content. Study Two showed that questions and exchange structures increased participant's interest in finding our more about forced removals and Apartheid history and their enjoyment of the stories. Exchange structures additionally increased engagement in the narratives. This shows their potential as effective interactions that can be included in digital storytelling in a way that does not require altering a narrative's content. Study Three conclusively showed that allowing users to trigger narratives by clicking on objects did not affect participant's experience of the narratives. However, Study Four unexpectedly showed that including story objects may well have a positive influence application in digital storytelling. There, museum visitors were free to stop using the prototype whenever they wanted (unlike the participants in Study Three). However, those who accessed narratives via story objects stayed longer and entered more questions. However, while these effects were significant, they were small and this finding warrants further investigation. In Study Four, we showed the response of users in an uncontrolled public setting. We that older visitors preferred a more passive storytelling experience compared to young visitors and that multiple visitors often attempted to engage with the prototype during one session. Also, since visitors are free leave a storytelling exhibit, it is important to consider way in which to hold their attention effectively.

Measuring Story Experience: In order to have a basis for evaluating our prototype, we built upon previous work to develop a psychometrically sound questionnaire to measure *story experience*, a multi-dimensional construct consisting of: *interest*; *enjoyment*; *engagement* and *storytelling realism*.

We also created psychometrically sound scales for measuring participant's *existing knowledge* of a set of narratives' context and their tendency to show interest in the kind of storytelling presented in our prototype (*interest tendency*). We further discovered that interest tendency was a significant predictor of story experience and without controlling for it using linear models we would not have been able to detect some of the effects of questions and exchange structures on story experience. Our questionnaire can be adapted by others seeking to reliably test the efficacy of storytelling applications while controlling for user's interest tendencies.

10.2. Summary of Research & Main Findings

This project explored the following five research questions:

1. *What **kinds of narratives** are used to convey personal experience of historical events?*

2. *What techniques are used in oral storytelling to make personal narratives (a) **dynamic** and (b) **interactive**?*

3. *Are audience-storyteller interactions from real-life personal storytelling effective in digital storytelling? We consider two forms of interactivity:*
    i. ***Questions**: The user is able to input questions to a storyteller agent by raising their hand during a narrative and during question opportunities, where the storyteller agent accepts multiple, consecutive questions.*
    ii. ***Exchange Structures**: the storyteller agent poses a question and prompts the user to input attempts at answering it until the correct answer(s) are reached.*

4. *Is the use of **story objects** as a mechanism for allowing the user to trigger narratives more effective than presenting narratives in a predetermined order?*

5. *Is an interactive digital storytelling system effective for engaging **museum visitors**?*

10.1.1. Research Questions 1 & 2: Studying Real-Life Storytelling

With our first question we sought to understand how personal experiences are conveyed through storytelling. The second addressed two hallmarks of oral storytelling: narratives vary each time they are retold and they present the opportunity for listeners and storytellers to interact – both aspects we were interested in recreating in digital storytelling. Our goal was that answering these questions would inspire insight into real-life storytelling that would lend itself to novel digital storytelling design. We addressed these questions in Study One: a thorough, three-month ethnography of ex-residents' storytelling in the District Six Museum, paying particular attention to Joe and Noor's tours. We focused on seven transcribed tours and conducted a discourse analysis of the five personal experience narratives that appeared most often. This revealed that their narratives exhibited the same structures and genres proposed for personal experience narratives in the well-established linguistics work of Labov (1972; 2010) and, Martin & Plum (1997) while explored the structure by

breaking narratives up into clauses, each relating a different utterance, event or thought. We also interacted with other ex-residents as well, most notably Linda Fortune who demonstrated her memory box, a collection of objects associated with her experiences of living in and leaving District Six. To address the second research question we analysed (a) how the narratives varied over multiple retellings, and (b) the guide-audience interactions.

Structure & Genre of Personal Experience Narratives:
In answer to our first research questions, we found that the structure of Joe and Noor's narratives matched the classic structure defined by Labov. Furthermore, they used two of Martin & Plum's genres: anecdotes, which convey the emotional and/or humorous aspect of an experience, and exempla, which convey a judgment or opinion regarding an experience. We also found that objects, often photographs, were routinely incorporated into narratives and, in Linda's memory box, listeners selection of objects determined which stories were told.

Narrative Dynamism & Interactivity:
Regarding our second research question, we found very little variation across retellings; their structures were remarkably similar despite some retellings occurring more than a month apart. This was consistent with Norrick's (2000) findings that a storyteller may repeat the same basic narratives in different retellings with minor adjustments based a current audience or context and that an oft-repeated narrative tends to be highly consistent across retellings. We also found that audience-storyteller interactions never occurred during the narratives' clauses, but rather, *between* them. We further observed the interactions mirrored those studied in Sinclair & Coulthard's (1975) work on teacher-pupil interactions during lessons. They matched the way that students ask questions, by raising their hands and waiting for a teacher's permission to speak, and the way that teachers ask questions, to which they know the answers, class to test student's grasp of lesson content and involve them in dialogue. The latter interactions are termed *exchange structures* and we observed that they were initiated by a guide asking a question and inviting the audience to attempt to answer while iteratively steering the audience toward the correct answer.

Digital Storytelling Design:
These findings led us to a design for digital storytelling with two main foci:

- Simulating storyteller-audience interactions:
    a. *Questions* which allowed users the ability to ask the storyteller agents questions
    b. *Exchange structures* in which the storyteller agents periodically ask the user questions and iteratively guide them towards the correct/appropriate answer(s)

- *Story objects* which when selected would trigger an associated narrative.

We designed a prototype to embody these ideas. It presented users with the five narratives we had analysed in detail in Study One and took the form of a simple virtual environment (VE) containing two storyteller agents, one based on Joe and one on Noor. The space was made to resemble the District Six Museum and included those objects that Joe and Noor referenced during the five narratives; some could be selected by users to trigger narratives.

10.1.2. Research Questions 3 & 4: Questions, Exchange Structures & Story Objects

Our third and fourth research questions related to the evaluation of the main design ideas implemented in our storytelling prototype. Research question 3 addressed the efficacy of questions and exchange structures while research question 4 was concerned with story objects.

Questions & Exchange Structures:

This project's third research question dealt with the efficacy of the questions and exchange structures as a means of interacting, during narratives, with a storyteller agent. Study Two tested the effect of questions and exchange structures with a sample of 101 university students. We measured participant's *story experience,* a construct that considers various aspects of a user's experience of the cultural heritage and historical narratives, namely: *interest* in finding out more about the narrative's context; *enjoyment* and *engagement* in the storytelling; *storytelling realism* – how real the storytelling seemed. These formed the dependent variables for Studies Two. We also collected control data that might influence these, namely participant's pre-existing knowledge of District Six and Apartheid-era forced removals (*existing knowledge*) and their predisposition to show interest in recent South African history and personal experience narratives (*interest tendency*). We measured the dependent and control variables with our own, psychometrically sound, questionnaire. We also logged participant's user activity during the question and exchange structure interactions and gathered their qualitative feedback.

We found that questions significantly increased participant's interest and engagement, while exchange structures significantly increased interest, enjoyment and engagement. Neither interaction, however, affected storytelling realism. The usage logs showed that most participants input numerous question and exchange structure inputs. They also showed that our design had some flaws; most notably the storyteller agents were unable to answer 65% of user's questions. This most likely played a role in the fact that questions did not increase enjoyment. In fact, 42% of those who experienced questions indicated they disliked them and the storyteller agents' inability to answer them successfully.

Story Objects:

The fourth question addressed the use of story objects as a way of allowing users to control the order in which they experienced a collection of narratives. Study Three tested the effect of story objects on story experience with a sample of 69 university students. We found that they did not impact any aspect of story experience. However, qualitative feedback showed that a high proportion of participants liked the inclusion of objects, in the VE, that were related to the narratives.

Overall Response to Interactive Digital Storytelling:

Overall, Study Two and Three's participants responded overwhelmingly positively to the prototype in both their behaviour during use and in complimentary qualitative feedback which indicated that they liked experiencing these narratives in an interactive VE. It was clear that what stood out most were the narratives themselves with many reporting that they found the narratives moving, painful, humorous, interesting and informative and especially responded to the fact that they were the stories of real people. Moreover, the overall story experience scores were very high – interest, enjoyment, engagement and storytelling realism scores were all non-normally distributed and clustered around the high end of our scales.

10.1.3. Research Question 5: Digital Storytelling at the District Six Museum

We addressed our final research question in Study Four. We used the results of Studies Two and Three in an attempt to improve the prototype (in particular improving the storyteller agents' question answering capability and soundtrack quality). Then we created an exhibit at the District Six Museum which ran for nine days during which time we observed 93 visitors use the prototype. We gathered feedback through voluntary feedback forms and logged usage activity. Just as before, there was a lot of positive feedback from museum visitors. Particularly positive were comments that suggested that the experience had felt like a "real lesson" and that the exhibit could serve as a stand-in for times when Joe and Noor are not personally available. However, we also observed that many visitors left the exhibit after listening to only a small proportion of the narratives (little more than one narrative, on average). They left the exhibit for a variety of reasons: loss of interest, hesitancy to interact with the prototype and, most often, having limited time in the museum or inviting a companion to put on the headphones and experience the VE. While story objects had no impact on story experience in Study Three, in Study Four they significantly impacted how long visitors spent at the exhibit. They resulted in visitors listening to about a half a narrative more than those who did not experience story objects. They also had a significant effect on the number of questions entered; story object narratives and predetermined narratives were combined, visitors entered one more question than visitors who experienced only story objects narratives. In general, visitors engaged with the prototype much more passively than Study Two and Three's participants. In fact, age was a significant predictor of the number of question and exchange structure inputs entered such that older visitors entered less input than younger visitors. Some older visitors even reported a preference for experiencing the narratives passively, viewing the interactions as detractors. Meanwhile, younger visitors participated in interactions readily and some even exhibited boredom during non-interactive stretches of narratives. Furthermore, although the prototype was intended as a single-user experience, often multiple visitors attempted to engage with it with takings turns to listen through the headphones or attempting to interact with it simultaneously. This would have resulted in visitors having a fragmented experience of the prototype. Regarding the improvements to the question interaction, there was an improvement of 13% in the number of questions the storyteller agent were able to answer. However, this still mean that 52% of input questions were unrecognised indicating that questions require further improvement. As expected, the prototype was clearly secondary to the guides' (Joe and Noor) storytelling receiving more visitors when they were unavailable. In some cases the exhibit encouraged visitors to join or seek out a tour with Joe or Noor.

10.3. Future Work

We close this disseration by looking to the future for work on digital storytelling which seems to simulate real-life storytelling. We believe that the prototype developed during this project has great potential to become an engaging and important way to conveying personal experience narratives; in Section 10.3.1 we suggest ways in which it may be improved and expanded, and in Section 10.3.2, we propose future design directions similar applications might explore. We close off in Section 10.3.3 with our concluding thoughts on the the future and challenges of interactive digital storytelling as whole.

10.3.1. Prototype Improvements

We consider our prototype as a work in progress, and the final step of our collaboration with the District Six will be for them to take ownership of it. We hope that it provides a base to build upon towards their goal of preserving and disseminating ex-residents' storytelling. We hope that using a completely free implementation platform and input files that allow easy updating of most of the prototype's content will facilitate this. Based on the results of Studies Two, Three and Four, the prototype, and our design, could be improved in a number of ways ranging from major improvements to more minor tweaks.

Questions:

The key next step for improving the prototype and having it reach its potential for delivering useful and engaging interaction with the storyteller agent would be to improve the quality of their question-answering capabilities In our work questions significantly improved some, but not all, aspects of story experience. It is not possible to deduce whether this was because the storyteller agents' questions repertoires were not extensive enough or whether this was due to the keyword matching algorithm we used to parse user questions. We believe that an important first step here is to conduct a user study to identify whether the storyteller agents simply did not "know" enough answers to questions or whether user questions tended to be misidentified. The former would suggest focusing on expanding the storyteller agents' question repertoires and the latter would suggest that a more sophisticated, methods for parsing and responding to user questions is needed. Previous work on natural language processing might be particularly useful here as well as integrating existing tools and methods for text classification including semantic methods such as the "bag of words" technique and syntactic sentence analysis (Graesser, et al., 2000; Rosé & VanLehn, 2005; Mayfield & Rosé, 2012).

Exchange Structures:

The recognition rate of exchange structure inputs was also relatively low, but this was not as concerning as with questions since unrecognised inputs did not hinder an exchange structure's progression. However, some study participants attempted to indicate that they did not know the answers to questions via such inputs as "I don't know". Thus, our exchange structures design would certainly be better if such inputs could be recognised and take an appropriate action (such as having the virtual audience provide answers instead). Additionally, it would be helpful is users could have an exchange structure's initiating question in cases where they may not have heard the questions. So, as discussed in Chapter 9, Section 9.2.2, an improved exchange structure design might allow users four possible actions, the two we used in our prototype and two additional actions. That is: input an answer; opt out of answering once; input or select an "I don't know" option which would lead to the storyteller agent giving specific hints; and request that the initiating question be repeated. Finally, just as with questions, exchange structures could almost certainly be more effective by improving the storyteller agent's language processing abilities.

Story Objects:

Although allowing users to trigger narrative by selecting story objects did improve story experience in Studies Two and Three, we still believe they may be useful if explored further. For instance, Study Four showed that including story objects resulted in slightly longer engagement with the prototype. It would be useful to try and replicate this finding in a large, more controlled study. Story objects

might also be improved by introducing text that appears when the user positions a pointer over it, which gives some idea of what narrative is associated with a particular object. Moreover, including objects that were related to the narratives was popular among users and offered visual complements to the audio narratives. Furthermore, we felt that our implementation of the Richmond Street panel – which moved and rotated during the appropriate point during that narrative – was quite popular with users. We believe it might similarly effectively to animate other objects during narratives. For example when a storyteller agent is discussing a particular photograph, it could enlarge so as to draw user's attention to it.

Improved Soundtrack:
Better recordings of Joe and Noor, but we stand by our idea of using recordings taken from tours at the museum.

More Content:
It would be ideal if narratives from other District Six ex-residents, such as Linda Fortune and Menisha Collins, could be added. Sadly, Menisha passed away during this project and the museum management expressed interest in memorialising her narratives by adding a storyteller agent based on her to tell some already-recorded narratives about her childhood and attending church in the building that now houses the museum.

10.3.2. New Design Directions

There were many observations from Study One that could prove fruitful directions for digital storytelling design; we chose to pursue those that seemed more prominent. We believe there are many more design directions that remain unpursued and that the results of Studies Two,Three and Four suggest additional, novel avenues for digital storytelling.

Multi-User Storytelling Virtual Environment:
In Study Four we noted that even though our prototype was a single-user experience, groups of visitors routinely attempted to share the experience, either by taking turns or attempting to interact with it simultaneously. As discussed in Chapter 9 Section 9.5.4, an ideal future design direction would be to a collaborative multi-user storytelling prototype. So, instead of using a virtual audience, storyteller agents could engage with a group of users (rather than just one user). An installation capable of presenting interactive narratives to many users simultaneously would not only be a truer simulation of real-life oral storytelling, but would also be more practical in a public setting. The prototype used in this project was successful in allowing us to test questions, exchange structures and story objects. However, the single-user experience is clearly not suitable in a public setting.

Representing a Collection of Narratives:
We found that guides at the museum drew from a consistent pool of narratives (a well-known trait of regular storytellers). Furthermore, they had a core repertoire of narratives that were most often told and, then, an extended repertoire that sometimes appeared. This could be replicated in a digital storytelling archive by creating narrative collections where the core repertoire is favoured while narratives selected from the extended repertoire are more variable based on user selections or interactions.

Location Specific Narratives:
Within the museum space, certain narratives were always told in particular locations, usually based on the objects in those locations. The idea of providing location specific expositions has been explored in real museum spaces with mobile tour guide devices. However location specific storytelling could be mimicked in a VE where storyteller agents might move around the virtual space or the user's movement might influence which narratives they experience.

Optional Narrative Clauses:
When exploring multiple retellings of narratives, we occasionally found that groups with less time to spend at the museum were told shorter versions of narratives. This gave us a sense of which narrative clauses were essential and which were optional and could be dispensed with if needed. Additionally, some Study Four visitors indicated that they would have liked to exit or "fast forward" a narrative. However, giving users this ability could be problematic since the aim of the prototype is to convey the narratives to users. Rather, a strategy that mimics what the guides might do should be more appropriate: if a user appears to not be attending to a narrative (by not facing the storyteller agent, for instance) or indicates that they wish to "fast forward" the narrative, the optional clauses could be omitted resulting in an abbreviated version being told. This way the user moves through the narrative faster, but without missing out on it altogether.

Audience Accommodation:
It was common for storytellers to make adjustments to their storytelling for different types of audiences. This phenomenon is called audience accommodation (Livo & Rietz, 1986), and we routinely observed this during Study One. Future work could explore gathering information about users and using this to adjust story delivery. For example, if the user is not South African, the storyteller agent might avoid exchange structures that typically require local South African knowledge to answer (e.g. that ask about local townships). Since older museum visitors in Study Four did not interact readily with the prototype, this idea could be taken even further by allowing users to select the amount of interactivity they would prefer or adjusting interactivity according user activity.

Subtle Control of Attention:
Real-life guides can glean an audience's attention using such cues as body language, direction of gaze and proximity from themselves. Based on the audience's attention levels, we noticed Joe and Noor adjust their storytelling and make eye contact with audience members not paying attention in order to draw them back into the storytelling (Ladeira & Nunez, 2007). Digital storyteller agents could similarly monitor the attention levels of users and make adjustments to better hold their attention. Additionally, the VE itself could give subtle cues to draw attention to storytelling. For example, highlighting the area around a storyteller agent and removing or greying out areas where storytelling is not occurring.

10.3.3. The Future of Simulating and Preserving Personal Storytelling
At the end of this project, we believe that we have only scratched the surface of what is possible when preserving personal experience narratives digitally. Here, we close off by suggesting three

major avenues of future work and their associated challenges. First, in the pursuit of creating compelling, realistic storyteller agents, we feel that integrating artificial intelligence techniques on synthetic interviews is crucial. This is one area we were not able to explore to its fullest potential given the scope of this project. However, there exists an extensive body work which seeks to create agents with expert knowledge which are capable of interacting with users in such a way that they appear human. This kind of work has much to offer to digital storytelling, yet it has been underutilised. Creating storyteller agents with natural language processing abilities and robust interaction techniques seems a natural next step in creating the "graceful" robust interactions described by Suchman (2007) and the human-like Type II agents described by Dautenbaum (1998). We feel that goal of creating digital storytellers give users the feeling that they are listening to and interacting with are real storyteller is attainable by drawing from state-the-art artificial intelligence work. The challenge in getting this right is balancing the goals of good storytelling and convincing interactions.

Second, we focused much of our effort in this work on testing the effectiveness which our prototype delivered Joe and Noor's stories. Our user studies and measures produced interesting data and conclusive findings on how users received our storytelling prototype. Still, these studies required us to narrow our focus on a snapshot of users' experience. Given the kind of narratives we worked worth, namely narratives of historical and cultural importance, it would be useful to conduct broader studies on the effects of presenting such narratives. For example, in our work, it would be interesting to measure the more long-lasting effects of experiencing Joe and Noor's stories such as their impact on attitudes toward Apartheid, or what emotional responses, if any, they aroused. The challenge here, of course, is finding a way to study the effects of experiencing digital storytelling over time and across a variety of sample populations. This kind of work would help us to know the true social impact of digital storytelling while pointing towards what design elements make for valuable digital storytelling and what can be dispensed with.

Finally, we believe that much more can be learned by carefully and methodically studying real-life storytelling. In our work we studied only two storytellers, in one very specific setting, yet the insights we gained from studying Joe and Noor gave us more design ideas than this project could explore. Furthermore, our experience of studying real-life storytelling allowed us to become highly familiar with the styles, rhythms and intentions of these two storytellers. Indirectly, our naïve observations about their storytelling led us to literature from the social sciences that we would not have, otherwise, thought relevant to the task of simulating storytelling. We believe further ethnographic study of more storytellers, in different contexts, could offer similarly rich sources of design inspiration. This method of studying real-life storytellers also fulfils one of digital storytelling's foremost impetuses, namely that of capturing and preserving personal narratives while their storytellers are still able to tell them. South Africa and Apartheid-era narratives is but one example of a body of narratives whose storytellers are aging and which may, as result, be lost. Throughout this project we have pursued the preservation of not only narratives but the experience of hearing them told in-person. For those hoping to capture and study real-life storytelling, we believe there are three big challenges. First, locating and preserving narratives which may soon be lost. Second, capturing and studying narratives as they are told naturally and conversationally. And, most challenging, analysing narratives in way that is contributes usefully to the design of effective interactive digital storytelling which captures the essence of oral storytelling.

Appendix A

Memory Box: Field Notes

A.1. Background Information

Linda Fortune used to be an education officer at the District Six Museum who wrote a book called *The House in Tyne Street: Childhood Memories of District Six* which is used a set work book at local high schools (Fortune, 2001). At the time of Study One she was no longer working at the museum and, since she left, had completed a Heritage Practitioner's course[24]. This prompted her to create a memory box – a creative expression of her personal stories from living in District Six. Linda accepts appointments for visitors to come to her home to experience her memory box. This experience is run almost like a tour of the box which Linda tends to tackle in a pre-defined order and usually associates certain stories with the objects in her memory box. Additionally the stories embodied by the objects relate to content from her book.

In this particular performance of her memory box occurred as a one-on-one interaction with the main researcher. Along the way she explained how she deals with the objects and what narratives she tends to associate with each. The following field notes show photographs taken during the performance along with descriptions of Linda's accompanying narratives and explanations. Occasionally we asked questions about the objects and about how audiences tend to perceive them. These questions labelled **Q** and Linda's answers are labelled **A**. Finally, this performance was not recorded as per Linda's preference.

A.2. Field Notes

The Suitcase:

The memory box is contained inside an old suitcase which Linda describes as "Uncle Freddy's suitcase" (Figure A.1). The suitcase is lined with images of the District Six area, street names and children. These images consist of photocopies from books about District Six, including her own and cut out photographs of street names. There are also advertisements cut out of newspapers which are either from the time when she lived in District Six or chosen because they feature a product she remembers buying in District Six or have the look of advertisements that would have been typical during her childhood. There is also a miniature washing line between the case and lid which represent the washing lines one would find outside District Six houses.

Q: Why use a memory box?

> **A:** There was one in the District Six Museum based on my book "The House in Tyne Street" which was created by Tracy Prosalindes with my input and when I left the museum I felt a loss. I missed the staff, the interaction with visitors and students. I invested ten years of my

[24] By the end of our project she had returned to her position as education officer at the museum.

life and did not quite realise how much the District Six Museum meant to me. That was why I created my own memory box intensively for three months.

Q: Do visitors ask questions during the memory box tour?

A: Yes, but I usually try to leave questions until the end

Linda moves on, the suitcase is open but she has not taken out any objects inside yet. She says "The streets of District Six were an extension of homes. The streets were part of our home… shaped us as people… there were more people than cars".

Figure A.1 The suitcase which houses Linda's memory box. It is an old suitcase that belonged to her uncle and it lined with photocopied pictures of District Six, street names, and newspaper snippets. Between the lid and case there is a miniature washing line like those one would find outside District Six houses.

The House in Tyne Street:

She takes out the first object, a model of her former home's façade on Tyne Street created on a square box (Figure A.2). She points out the letter box on the front door and tells a story about waiting for school reports to be delivered through the letter box. "…waiting for the 'flop!' and then I grabbed it and opened it myself!". She then opens the box to reveal the interior. Behind the front the house's façade it a photocopied picture of the interior entrance way of a similar house leading to the kitchen. Linda describes how the entrance ways of houses in District Six were lined with sheets of 'lino' (linoleum) and describes how people would replace it every year. She also uses the picture of the entrance way to point out how high the ceiling of their house was.

The other half of the box shows another Tyne Street building – the Ghiwala Brothers' Eastern Gem Spice factory. The box contains little plastic labelled bags containing spices that one would have typically found sold there. Referring to the spices, Linda says that smell and touch are important in experiencing the memory box and she encourages people to pick up and directly interact with the objects in her memory box.

Figure A.2 This is the first box presented in Linda's memory box performance. It represents her former home on Tyne Street with a model of the house façade on its exterior (left). The right hand image shows the inside of the box: the left side of the box shows an image of the entrance way of a typical Tyne Street house; the right side shows an image of Ghiwala Brothers' Eastern Gem Spice Factory, which was also on Tyne Street, along with bags of spices sold there.

District Six Shops:

Next Linda takes out box models of various shops in District Six (these are not usually presented in any particular order). The first shop is labelled 'stinkvis' (i.e. dried out fish biltong) and the model shows the interior of a the shop and incorporates real food such as dried mielie kernels, cinnamon sticks, peanuts, cake mixture, mebos (traditional South African fruit preserve). Some of the model packages show measurements in pounds. On the exterior, there are snippets of articles about District Six (e.g. Streets exhibit). The next shop Linda shows me is labelled 'The Sweeteries'; she explains that this was Mr Goodwin's shop and explains that he sold sweets and comic books. This model also has images of children and a kitchen at the back of the box. Both these shops are shown in Figure A.3.

The Little Wonder Store is presented next using a box, shown in Figure A.4, containing objects that were sold there. The tray is mounted on a board which is covered with a photocopied picture of Hanover Street, where the store was located. On the picture of Hanover Street a bus top is highlighted in colour; Linda explains that the bus stop was next to the shop.

She then tells a story about looking for "flos cotton" (embroidery cotton thread) at the Little Wonder Store. She jokes that everything that was sold there "seemed to be 'Made in England' … now it's 'Made in China' (*giggles*)". Linda explains that she has chosen cottons with bright colours for this model "because people in District Six were very fashion conscious". She says that you could tell which area someone lived in by their clothes, saying you could tell if someone was from the Northern Suburbs or from District Six. One of the reasons for this was that the dressmaker in District Six was more fashionable. She sometimes switches into speaking Afrikaans while telling me this (she knows that I can speak Afrikaans). From the adverts in this model she points out different styles of clothing. Linda explains that the objects in this model are gathered from her memories of District Six and the Little Wonder Store. Most of objects come from "Auntie Carolyn's sewing box, there is also a flower from Linda's wedding dress.

Figure A.3 Miniatures of two District Six shops: a food store (left) that sold dried out fish and grains and Mr Goodwin's shop which sold sweets (right).

Figure A.4 A box about the Little Wonder Store, a large general store and haberdashery on District Six's main street, Hanover Street. This box shows the bus stop that stood next to the store highlights (on the left) and contains: objects from "Auntie Carolyn's sewing box", flowers from Linda's wedding dress and advertisements for the kinds of products sold at the store.

The General Store model has been modelled on the inside of a shoebox lid and shows typical groceries and brands that Linda remembers from her childhood (Figure A.5) and that were typical in District Six such as Phensic headache tablets, Zambuck ointment and Cartwright's curry powder. She mentions "People were poor but particular! It had to be Snowflake and Koo!".

Figure A.5 A miniature of a general grocery store containing products and brand that Linda recalls from her childhood. Some of these brands are still available in South African stores today and some are not.

Figure A.6 A wedding-themed box. The cover (left) shows a lace-framed picture of a wedding in District Six. The box opens to reveal three surfaces (right). The first surface shows Linda on her wedding day, the middle fabric from the popular District Six fabric shop, Van der Schyff's, and the third a collection of smart ladies shoes such as those that were fashionable when Linda lived in District Six.

Weddings and fashion:

Next Linda presents a wedding-themed box. It is covered with a lace-framed picture of a wedding in District Six, taken from Linda's book. The box folds out to provide three inner surfaces on which Linda has placed pictures and objects. Figure A.6 shows the cover and three inner surfaces. Linda

says that she has purposely made this box informal (e.g. using large hand sewn stitches) to show "you don't have to be fancy to get the story out". The top inner surface has a picture of Linda on her wedding day and in the adjacent box there are pictures from others' weddings as well as a piece of fabric from Van der Schyff's material shop from whom everyone in District Six wanted to buy material for their wedding dresses. The back part of this box has images of ladies shoes which reminds Linda of the kind of shoes worn by women in District Six. Pointing at one of the shoes she says "I had a pair of these, oooh I loved them!". She also mentions that she hoped to imitate the shoe shop window with the back part of the box.

Pine kernels:

Next Linda shows me some pine kernels: "We socialised around a pine cone… fetched them from Table Mountain… made tamalejies (pine kernels cooked in thick sugary syrup and cut into a squares; a Cape delicacy) from them to sell".

"Dad":

The next box contains objects related to Linda's father (who is the subject of a chapter in her book). It contains a miniature of a green haversack, shown in Figure A.7 , which opens and contains items. This haversack is representative of her father's military history, "My father was soldier in the Second World War". Additionally, Linda's book tells of how her father carried a "khaki canvas haversack". The haversack contains a painted match box labelled 'Lunch Box' and miniature of a canteen; these objects relate to her father being a keen fisherman and hiker (her book specifies that he used to fish for crayfish, especially at Oudekraal on Cape Town's coast). The match box is representative of the matches her dad would take when camping: "The reason why I used a match box for the lunch box is to demonstrate that a memory box can be any size or shape. No matter how big or small it can contain a story for the person who created the box". The lunch box represents the lunch box her mother would pack for his fishing and camping trips. She would typically pack him fruit (note the paper bananas and miniature apples), biltong (small package labelled 'Biltong') and/or a sandwich (miniature sandwich), "He got something different every time". At this point Linda notes that she can shape or direct the story in many different directions, depending on who her audience is.

Figure A.7 A miniature model of a green knapsack like the one Linda's father owned. It contains a matchbox representative of the matches her dad would take when camping. It is modelled as a lunch box to represent the lunches Linda's mom would pack for her dad when he went on fishing trips at Oudekraal.

Figure A.8 Teddies to represent Linda's childhood pet cats, Winnie and Blackie.

The Cats:

Linda shows me a pair of miniature cat teddies and a mouse teddy, shown in Figure A.8 , she had made especially for her box. These teddies represent her family's cats and she also briefly mentions Jessie, a lady who fed stray cats in District Six. We don't talk in depth about these narratives, but in Linda's book there is a chapter entitled *'Winnie and Blackie and Jessie the cat lady'* in Linda's book. Winnie (grey) and Blackie (black) were Linda's family cats and are represented by the two cat teddies. It is during a visit to Jessie's home that Linda remembers first hearing about District Six being declared a whites-only area. The story goes on to explain that Jesse moved out of District Six but still came to feed the stray cats on Fridays. The story is picked up again in a later chapter called 'Changing Times' which describes the sad time of Linda's father falling ill and residents starting to leave District Six. The story explains that Jessie, "fairy god mother of the cats", eventually stopped coming to feed the cats.

Childhood, Games, Eviction and Demolition:

The next box Linda shows me is a box about childhood and the games played in District Six. She unpacks numerous objects, shown in Figure A., used to play games or provide entertainment during her childhood. Other objects in this box include: a spinning top; marbles; Cape minstrels postcard; stamps arranged in chronological order or "in terms of inflation". There is a mix between objects which are actual size (such as the marbles and stones) and miniatures (such as the skipping rope). Linda mentions the improvised nature of using these objects. The stories she tells depends on which objects attract listener's attention – what they pick up and choose to interact with. For instance, my attention is drawn to the game called 'Five Stones', Linda then opens the packet containing the stones and we sit on the floor and she explains how the game works and I try to play it (it is quite fun).

Linda then talks about some Apartheid history, also based on objects in this box. She points out the old South Africa flag on one of her stamps and mentions "My father hated the flag". She then

presents me with a beadwork of the new South Africa flag. The box also contains an empty pen box, shown in Figure A.10. This is linked to a personal narrative related to the eviction of Linda's family from District Six. The box used to contain a fountain pen with Linda's initials engraved on it. She has received it as a gift when she was in school; it was one of her favourite possessions. While her was signing papers relinquishing the family's home, using Linda's pen, the official handling their eviction stated "If you give me the pen I will see to it that you get a nice house". Linda uses this story to point out "the power of the pen". The final thing Linda shows me is a map of Cape Town and its surroundings suburbs. The Cape Flats are highlighted to show their racial segregation.

Figure A.9 Top left: a bag of stones for playing a game called "five stones"; straws; sherbet; playing cards; a quote from Linda's book. Top right: a pinball game that could be bought at cafes in District Six. Middle left: a pamphlet for the original 'Streets' exhibit that sparked the founding of the District Six Museum; knitting; bouncing ball; thread; cricket ball; skipping rope miniatures; and a packet of charms used for a trading game called "charms". Middle right: comic books including older serials *Archie* and *Beano* and, below them, a recent comic about Nelson Mandela. Bottom left: a piece of knitting using nails because one first learned to knit using nails and then later got to use real knitting needles. Linda: "Here I also demonstrate the learning process of knitting with fallen stitches. While learning to knit it happens so the more one practises the better you become". Bottom right: a page containing writing out punishment such as that given in school. Visitors are invited to add lines to the book.

Final thoughts:

We close off by talking about Linda's storytelling. She tells me that she adapts her storytelling to the needs of the person listening to her.

Q: I notice you laugh from time to time while telling your stories, why is that? Is it a cue for your audience to laugh as well?

> **A:** …little snippets about the story can be amusing. I think why I do this sometimes is because the forced removals is a traumatic, sad story. I get emotional at times while I unpack the box… (it) takes me back to that particular time in my life). My audience sometimes express

their shock and anger and emotions and at times I try to find or express the humour and the stupidity of what the government. This is again how I try to be sensitive to myself and my audience to divert from the sadness, which could and can become a heavy subject. ”

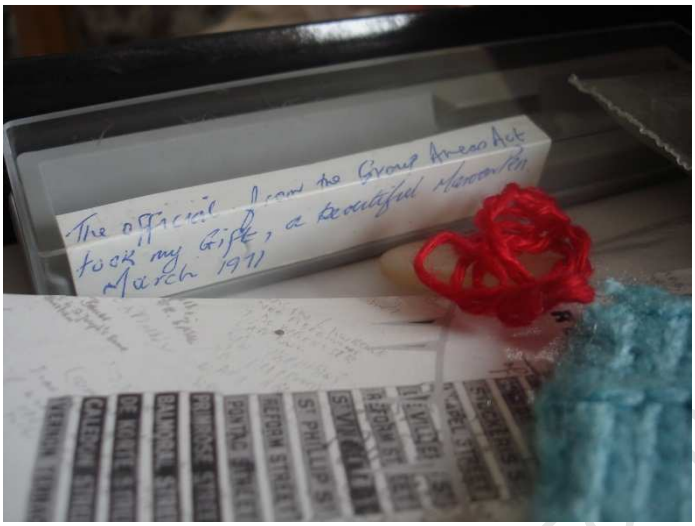


Figure A.10 Linda’s pen box; its label reads: ““The official from the Group Areas Act took my Gift, a beautiful Maroon Pen. March 1971”.

Appendix B

Study One Discourse Analyses: Full Narrative Transcripts

B.1. Group Areas and Mixed Marriages Act Narrative, Noor

B.1.1. Tour One

Orientation 1 (told as anecdote) (11 Feb 1966):

Abstract:
Now I remember in 19- you see what was sad, we didn't even know this was going to happen to us.

Orientation:
Going to work that morning, Feb- can you see the date on the wall there? (*the children look towards the wall and some read the date out loud*) February 1966, when we came into to town, we saw the headlines in our newspapers.

Complicating Action:
District 6 declared a whites-only area.

Audience Comment:
Child: "They didn't even tell you!"
Noor: "They didn't tell us, no. We only saw the morning, on our way to work."

Evaluation:
So we saw the posters, of course, people were, were shocked, people were angry, 'What the devil is going on now?' Because people were worried, 'What's going to happen to us?', 'Where are we going to?', 'We going to be separated from our friends, our neighbours and even out families.'

Orientation 2 (first bulldozers):
But things, you know, cooled down. But then in 1970, now that's the time that the government sent in the first bulldozer. Did you ever see a bulldozer? (*pauses very briefly looking at the children*) You can see it, see one of those photographs (*points in direction of photographs*), there's bulldozers over there.

Orientation 3 (11 years):
Then they sent first bulldozer in, and then they started bulldozing everything. It took them 11 years to do that – eleven years. They did it gradually, in stages.

Orientation 4 (split people up):
Now, what was also sad, you know, when people were moved out of District 6, the government then (*pause*) split people up into the different racial groups. Now I always say into different colours, because the issue was we the wrong colour, we weren't white, right?. Now, during Apartheid years the government called me (*pause*) a coloured. And I said to them 'I am not a coloured, I'm a human being, I'm a South African, that's what I am. Why do you call me a coloured?' But that's the term they used, right?

Orientation 5 (townships):
So what they then did was, they sent all our so-called coloured people to the coloured townships. There's about 14 different areas, the first area was called Hanover Park, right? After Hanover Park they build a placed called Lavender Hill and the third area was called Michell's Plane. Now Michell's Plane, (have) you heard of Michell's Plane?, is about 35 kilometers from here. But there's Bontheuwel, Heideveld, Manenberg, Delft, uuuum even some people even when to the West coast, you've heard of Atlantis, nê? I mean it's a distance form here, some people even went to Atlantis. That's where they send all our (*pause*) so-called coloured people. Then if you were Indian or Hindu,l you had to go to the (*pause*) Indian township, so they couldn't go with us to the coloured township, hmm? And then all the black people were first sent to, Langa was the first area, there's Guguletu, there's Nyanga and near Mitchel's Plain is a place called (*pause*) Khayelitsha. Now Khayelitsha, is about 45 kilometers from here.

Orientation 6 (Edith):
Now we've got a lady here, uh she works here, Edith, she lives in Khayelitsha. She, we start at 8, supposed to be at 8, she catch the bus every morning (*pause*) at 6 in the morning, now she gets here after 8. Nowadays, it take her two hours, two hours on the bus hey. And she spends more than, what, 3, 4, maybe 500 rand on travelling alone. Inconvenient, very inconvenient, nê.

Orientation 7 (Noor's friend):
Now, you know even, even families were split up, hey. Now in my street… my friend, we played together, we grew up together, we lived in the same street.

Orientation 8 (marriage):
Now my friend was (*pause*) coloured, he was married to a black woman, alright. They were legally married in District 6.

Complicating Action:
In 1972, when they had to leave their home, they couldn't live together anymore. Now you imagine – can you imagine! They were married!

Audience Interaction:
But they couldn't live together because she was (*scans the audience; there is no response*) black and he was (*scans the audience; there is no response*) coloured, right?

Evaluation and Result:
You know what the government did? The government said to the wife 'You must go to Langa with your 3 children because the children were, they were dark skinned, so they were classified as (*pause*) black! Right! And the husband got sent to Michell's Plain. See what the government also did, they also split up families and he couldn't see his wife. If he want to see his wife he's gotta go to the (*pause*) police station. Now the police station is still across the road, you can see it from here, that's the Caledon Square police station. He must go there and get a permit to see his own wife. And he was allowed to see her every 3 months for 2 hours only. They were crazy hey? They were absolutely crazy what they did to people.

Audience Questions:
Child One: Do they live together now?

Noor: They, they still together. But, after 10 years, after 10 years.

Child One: *inaudible*

Noor: After 10 years. I mean, he didn't see his children grow up! Ok. Ok.

Child Two: Sorry um, but um, um, was, if, if, if, how can families be split up?! I mean um-

Noor: That's what the government did!

Child Two: But, but, uh, uuum-

Noor: It, it's difficult to understand, nê [translation: hey]? It's difficult to understand, nê [translation: hey]?

Child Two: What happened if there's two different races married together? Then they would just-

Noor: They would just, they would just split! They won't look at the colour of your skin. That's what Apartheid did to us. Can you imagine what we went through? Now, I just said I'm sixty-one, sixty-three years old and I *lived* through Apartheid. They were *crazy*! They were *crazy* what they did to people! Right? Now-

Child Three: Sorry, how old were you, when they-

Noor: I was about 31, that time. Ja, ja [translation: Yes, yes].

B.1.2. Tour Two

Orientation 1 (11 Feb 1966):
So then, February 11th, 1966, you can see the date on the wall there (*points towards Demolition & Decay exhibit*). Now that's the date when the government declared District Six, a whites-only area.

Orientation 2 (first bulldozers):
And then in 1970, they sent in the first bulldozer.

Orientation 3 (11 years):
And then they started bulldozing everything, (*pause*) including ten churches. So now, they had no respect even for a place of worship. And it took them almost eleven years, to bulldoze District Six. You can imagine almost seventy thousand people live here, so District Six was, in fact, the biggest area in South Africa.

Orientation 4 (split up people):
Now, you know what was sad, when people were moved out of District Six, the government then, sort of, you know, split people up, into different, racial groups. Now I always say into different colours, because the issue was (*pause*) we had the wrong colour, we weren't white, ja.

Orientation 5 (townships):
So what the government did was, they sent all our, so-called 'coloured' people to the coloured townships.

Exchange Structure:
Noor: An- do you know any of the townships in Cape Town?

Student: Mitchell's Plain.

Noor: Mitchell's Plain is one of them, there's a place called Hanover Park, and Lavender Hill. There's Bontiheuvel, Heiderveld, there's about fourteen different areas. Then of course all the Indians, and Hindus, were moved to Rylands and Cravenby, that's an Indian area only.

Exchange Structure:
Noor: Now where do you think, where did all the black people go to?

Student: Soweto

Noor: No, in Cape Town, in Cape Town.

Student: Gugulethu.

Noor: Gugulethu is one of them, ja.

Student: Khayelitsha.

Noor: Khayelitsha, Khayelitsha is the biggest area today. They've got more than, one point six million, people living there, today. There's also…?

Student: Langa.

Noor: Langa was the first area, then Gugulethu, then Nyanga, and then of course after that, Khayelitsha.

Orientation 6 (Noor's friend):
Now you know in 19(*pause*)72, now I had a friend, we lived in the same street. Now, I lived in a street called Caledon Street, ok, which was here (*points to a photo of his street on his photo wall*), I'm a show you now.

Orientation 7 (marriage):
Now my friend was, coloured he was married to a black woman, right, they were legally married.

Complicating Action:
When they had to leave their home in 1972, they couldn't live together anymore.

Evaluation & Result:
Now can you imagine that - they were married, hey! Because she was black and he was coloured, so the mother had to go to Langa, with the three children. Because unfortunately the children, they were, dark skinned, so they were classified as (*pause*) black. And the father was sent to Mitchell's Plain. See what the government also did? They also split up families and he couldn't see his wife. He's gotta go to the police station. Now the police station is still across the road you can see it from here (*points towards the police station*). He must go there, and get a permit to see his own wife. They were crazy, hey? What they did to people, right?

B.1.3. Tour Three

Orientation 1 (told as anecdote) (11 Feb 1966):

Abstract:
You know what was so sad? We didn't know this was going to happen.

Orientation:
I remember in 1966, February, 1966, you see the date on there? (*points towards date on the wall*). On our way to work, that morning when we came into town, like overseas visitors will say 'the city centre', when we came here we saw the headlines in our newspapers!

Complicating Action:
Big! District Six declared a whites only area.

Evaluation:
Of course, people were sad, angry, right? People were worried 'What's going to happen to us? Where are we going to? We're going to be separated from our friends, our neighbours, and even our families!'.

Orientation 2 (first bulldozers):
But things, you know, cooled down, and then in 1970, that's the time when the government sent in the first, you know that big machine (*uses hands to indicate 'big machine'*) called a bulldozer?

Exchange Structure:
Noor: Have you ever seen a bulldozer? (*Scans across the group waiting for an answer*)

Child: Yeah.

Noor: You can see it on that picture there (*points towards pictures in Demolition & Decay exhibit*).

Orientation 3 (11 years):
And then they started bulldozing, everything, including ten churches. So in other words, they had no respect even (*pause*) for a place of worship, right? And it took them almost eleven years to bulldoze District Six. You can imagine between sixty-five and seventy thousand people lived here, it was the biggest area in South Africa, right.

Orientation 4 (split up people):
And of course what was sad, when people were moved out of District Six, the government then, split people up, into different racial groups. Now I always say into different colours, because you remember I said the issue was the colour. We had the wrong colour, right? During Apartheid years, the government called me a coloured, and I remember saying to them 'I'm not a coloured! I'm a human being!' right? I'm a South African, that's what I am. But, they wouldn't listen to me.

Orientation 5 (townships):
What they did was (they sent the) coloured people to the coloured townships, right? Hanover Park is one Mitchell's Plain, you've heard of Mitchell's Plain? Mitchell's is far away! Then there's Heideveld, Bonteheuwel. There are so many areas, about fourteen different areas. Then all the Indians and Hindus were moved to Rylands and Cravenby, and I couldn't move there, because I was classified as a coloured, right. And then of course all the, the, the African people, the black people, like the Xhosas, the Zulus, they was first sent to Langa.

Exchange Structure:
Noor: You've heard of Langa?

(*there are some yes's and ja's from the group*)

Noor: Gugulethu, Nyanga and also Khayelitsha, right? (*more yes's and ja's from the group*)

Orientation 6 (Edith):
Now, Edith, she's somewhere here (*gestures towards the front desk where Edith usually sits*), now Edith lives in Khayelitsha. You know, she - every morning, she has to catch a bus at six in the mornings, she gets here after eight. So it take her two hours to travel sometimes to work, and it's very expensive also! She spends a lot of money on traveling, right?

Orientation 7 (Noor's friend):
Now, in 1972, now my friend, we lived in the same street. My friend was coloured, right?

Orientation 8:
He was married (*audio lost*)…

Complicating Action:
(audio lost, but we assume Noor told about his friend being separated from his family)

Evaluation and Result:
What do you think of that!? They were legally (married but) they couldn't live together because (*audio lost*) and he was coloured, right? (*audio lost*) I always said you got crazy what they did (*audio lost*)

B.2. From Bloemhof Flats to Cape Flats Narrative, Joe

B.2.1. Tour One

First Narrative:

Orientation:
Take a look at this big building that's being destroyed over here. And, again, if you look at your view in the back, it is Table Mountain. If you'd been outside your view to the left would be Devil's Peak, your view to the right would be Lion's Head and Signal Hill and my view from this balcony *(points in the picture)* was right across Table Bay and the Hottentot's Holland mountain

Complicating Action:
And my home is being destroyed here, because a developer needed parking space for people's cars.

Evaluation and Result:
So we kicked out of those solid structures and, of course, we placed in what you know as the Cape Flats. Those barrack-like structures *(points to paintings of Cape Flats housing over the door way to the coffee shop)* that all look the same – they all look the same! And if you a drinking man, you gonna walk into the wrong house at some stage or other. *(some giggling in the audience)* Vrydag aande is fight aande om die verkeerde man uit die kooi te kry [translation: Friday night is fight night to get the wrong man out of bed]!

Second Narrative:

Abstract:
And as you well know what it is like living out there. Now you can imagine what this did to people who were living in areas like this Newlands. Cape Town. Simonstown. And suddenly finding yourself.

Orientation 1 (whole communities):
Everything that's community-based was been destroyed your churches, your schools, your sports clubs, all these were destroyed.

Orientation 2 (when I lived in D6):
When I lived here in Bloemhof Flats, I virtually knew everybody else, everybody. Everybody knew me, if not by name, by a hand wave or by sight, because everybody virtually knew everybody else.

Complicating Action:
Suddenly I find myself in Hanover Park. Don't know my neighbour on my left, on my right, front of me, behind me or above me.

Evaluation:
All of us are living in isolation. And that was part of the engineering. Divide 'n rule, split people up, so they always on, wrong footed. So there can be no getting together, because people are now trying to get their lives together.

Third Narrative:

Abstract:
Y'can imagine what this did to the older folk.

Orientation 1:
A lot of the older folk died, and I suppose their death certificates would have said 'died of natural causes' - those death certificates should be revisited, it should say 'died of depression and broken hearts'

Orientation 2:
Friend of mine lived out in Seapoint, Tramway Road.

Complicating Action:
His father received his notice. Read the notice. Coupla days later, walked outta the front door. And they found him hanging in the trees between Seapoint and Camps Bay.

Evaluation and Result:
One of many suicides committed by people who couldn't stand the fact that we'd been taken out of our sheltered areas and being thrown amongst the wolves in the Cape Flats.

B.2.2. Tour Two

First Narrative:

Orientation:
If you take a look at this building that's being destroyed here, there's this one over here (*points to a photo of a building being demolished*). Then if you look at your backdrop (*points*

to the background in the photo) Table Mountain. As you sitting, if this had been outside, you'd see Devil's Peak (*gestures to the audience's left*). To your right you would see, Lion's Head and Signal Hill (*gestures to the audience's right*) and my view from this balcony (*points to the balcony of his childhood flat in the photo*) was right across Table Bay and the Hottentot's Holland mountains in the distance (*gestures into the distance*).

Complicating Action:
And my home is being destroyed here, (*pause*) because a developer (*gestures toward his left*) needed parking space for peoples cars. (l*ong pause*) So that is being destroyed, four stories high, thirty-two dwellings inside that, complex - for people to park their cars.

Evaluation and Result 1 (township housing):
Now we taken out of those solid structures (*points back to the picture of Bloemhof Flats being demolished*), now we put into those barrack-like structures you see above the door there (*points towards the wallpaper pictures above the doorway to his right*). Those barrack-like structures that were rolled out in their thousands out in the Cape Flats. Those barrack-like structures that all look like, exactly the same, so that if you're a drinking man, you gonna walk into the wrong house at some stage or other, (*some in the audience laugh*) promise you. Friday night's normally fight night, getting the wrong guy outta the wrong bed (*some giggling from the audience*). And they were so small you couldn't even change your mind in it, let alone change your furniture around in the damn thing.

Evaluation and Result 1 (health implications):
And some of them were so poorly constructed there weren't even floor coverings, internal ceilings or internal doors, and ironically I worked for the Health Department at that time. Now we had to lobby the government if the municipality at its own expense could put that in, to give the people a modicum of comfort. Now you must remember that these were rolled out in their thousands out in the Cape Flats, just built. So when those buildings started settling, they started cracking and leaking, (*pause*) till it became draughty, leaking, damp. So what happens? Respiratory diseases developing. Your TB's, your bronchitis's, your pneumonia's, your asthma's. And you can imagine how it affected the health of people, coming out there. And you look at what those roofs are made of.

Audience Comment:
Audience member: Asbestos.

Exchange Structure (attempted):
Joe: Asbestos. (*pause*) *All* those roofs made of asbestos and what do you thinks gonna happen in a couple year's time, when that asbestos starts flaking and peeling?

(no response from audience)

Joe: Asbestosis, another problem developing.

Second Narrative:

Abstract:

Now you can imagine what this did, to people who'd been living in areas, as a fixed community.

Orientation 1 (whole communities):

Because what happened is, when you were kicked out, you weren't kicked out as a community, oh no, divide 'n rule. They split people up, they broke up solid communities. Church congregations were destroyed, sports clubs was destroyed, schools were destroyed. Everything that was community based was destroyed.

Orientation 2 (when I lived in D6):

When I lived in this area here in Bloemhof Flats, I virtually knew everybody in that, in that project, (*pause*) and everybody knew me. Outside of that, walking through District Six, though you didn't know by name, but the mere face of seeing somebody familiar around you there, there was a wave and a smile. Even when the worst were supposed to be gangsters.

Complicating Action:

But, suddenly you're uprooted, and I find myself in Hanover Park, I don't my neighbour on my left, on my right, in front of me, behind me or above me.

Evaluation:

Everybody's in total isolation.

Third Narrative:

Abstract:

Now you can imagine what this did to people that are seventy, eighty years old, (*pause*) who've lived all their lives in that specific area, who're suddenly uprooted, taken out and thrown into, (*pause*) people they don't know.

Orientation 1 (a lot of old folk died):

You find a lot of the old folk, they died. And I suppose their death certificates would have said 'died of natural causes, I say those certificates should be revisited. It should say 'died of depression and broken hearts', because that is what they certainly died of.

Orientation 2 (personal friend of mine):

Personal friend of mine, lived out in Sea Point, Tramway Road.

Complicating Action:

His father received his notice, they read the notice, few days later he walked out of the front door, and they found him hanging in the trees between Sea Point and Camps Bay.

Evaluation and Result:

One of many suicides committed by people, who couldn't stand the fact that they were being taken out of their sheltered areas, and thrown amongst, (*pause*) complete strangers out in the Cape Flats.

Audience question:

(*an audience member raises a hand a moment of silence*)

Joe: Yes, question.

Audience member: *(inaudible)* suicide *(inaudible)* or was that a cover up?

Joe: Well, what happened there, that would obviously have said 'suicide'. But it wasn't going to be coming to the papers.

Audience member: But the statistics are there?

Joe: The statistics are there.

B.2.3. Tour Three

First Narrative:

Orientation:

You look at this big building being destroyed over here (*points to a photo on the wall behind him*) there's this one over here. And again if you look at your backdrop – it's Table Mountain (*points to Table Mountain in the photo*). And if we'd been sitting outside the view to your left would have been Devil's Peak, your view to your right would have been Lion's Head and Signal Hill. And my view here from this balcony (*points to the balcony of the flat he lived in*), 'cause that's where I lived, was right across Table Bay and the Hottentots Hollands mountains in the distance. (*pause*)

Complicating Action:

And my home had been destroyed there, because a developer needed parking space for people's cars. (*pause*) So they destroyed my home here, kicked me out and then built garages so people could park their cars there.

Evaluation and Result (township housing):

And we taken out those solid structures and we placed in those barrack-like structures you see above the doorway there (*points to paintings of the townships houses*). Those houses that all look like exactly the same. Now, if you were a drinking man you gonna walk into the wrong house at some stage or other, (*some of the audience members laugh*) promise you. Friday nights were normally fight nights to get them out of the wrong beds there. And they were so small you couldn't even change your mind, never mind change your furniture around in the damn thing.

Evaluation and Result (health consequences):

And so poorly constructed, you must remember those things were rolled out in their thousands, to take the people who had been thrown out their respective areas. And when those buildings started settling, they started cracking, leaking, drafty. The result - your respiratory diseases, like your TBs, your pneumonias, your bronchitises, your asthmas developing in th-, in those places. They became veritable fridges, I feel almost convinced you could put a slab of beef in (*audio lost*). That's how cold those places were.

Second Narrative:

Abstract:

Now you can imagine what this did, to people (*audio lost*), especially the older folk who were suddenly uprooted.

Orientation 1 (whole communities):

And, remember, when you were uprooted, you weren't taken out as a community - no individually you were given notices and sent to various areas. So they destroyed completely, complete, communities - church communities, your sports communities, your school communities. Everything that's community based was totally destroyed.

Third Narrative:

Abstract:

You can imagine what that did to the old folk, seventy, eighty years old, were suddenly uprooted and found themselves totally in no-man's land.

Orientation 1:

A lot of those old folk died (*pause*) and I suppose a death certificate would have said died of natural causes. I say they should be revisited and it should say 'died of depression and broken hearts', 'cause that is what they actually died of.

Orientation 2:

Personal friend of mine lived out in Sea Point, in Tramway Road.

Complicating Action:

His father received the notice, read the notice, few days later, they found him hanging in tree somewhere between Sea Point and Camps Bay.

Evaluation:

One of many suicides that were being committed by people who were being kicked out their respective areas and thrown amongst total strangers.

Orientation 2:

When I lived here, in Bloemhof flats, I virtually knew everybody in that flats and everybody knew me. And even walking through District six if you didn't know by name, it was a face, it was a wave, it was a smile, it was a greeting, so everybody knew virtually everybody else.

Complicating Action:

Suddenly I find myself in Hanover Park. I don't know my neighbour on the left (*gestures left*), my right (*gestures right*), in front of me (*gestures forward*), behind me (*gestures behind him*), above me (*gestures above him*), and even above me.

Evaluation and Result:

We were all in total isolation. Now you can imagine what this did to people's lives. It destroyed it completely, the community fabric. It takes about thirty to forty years to build up a community. And people had to start virtually from scratch where they were, to start their sports clubs, they had to start their churches, they had to start their community centres. Everything had to be started all over again.

B.2.4. Tour Four

First Narrative:

Orientation:

Take a look at this big building that's been destroyed here (points to a photo, clears throught and points back to the photo) this one over here. And again, you look at your backdrop, (points to Table Mountain in the second photo) it's Table Mountain. As you're sitting, your view to our left (gestures left) would have been of De-Devil's Peak. Your view to your right (gestures right) would have been Lion's Head and Signal Hill and my view from this balcony (points to the balcony of his flat in a photo of Bloemhof Flats' demolition), 'cause that's where I lived, was right over Table Bay and the Hottentot's mountains in the distance. (pause)

Complicating Action:

And my home is being destroyed here, because, the developer needed parking space for people's cars, (pause) so they destroyed my home, and then built garages.

Evaluation and Result (township housing):

And they took us out of these solid structures, and placed us in those barrack-like structures you see above the doorway there (points to the paintings above the doorway to the coffee shop). Those barrack-like structures that were rolled out in their thousands on the Cape Flats. (pause) And you can see they all look exactly the same. If you're a drinking man, you're gonna walk into the wrong house on many occasions, promise you.

Evaluation and Result (health consequences):

And they were so hastily constructed, that when they started settling, (pause) they started cracking and leaking, becoming draughty. (pause) And with the result, (pause) you developing your respiratory diseases like your TB's, your bronchitises, your pneumonias, your asthmas. (pause) And also have a look at that all those buildings' roofs are made of asbestos. It's now fifty years down the line, what do you think's gonna happen to those roofs when they start flaking and chipping? There's every chance that we could be developing

asbestosis and stuff - a cancer developing from that if nothing is done, about those, particular type of roofs. Now you can imagine, that some of them were constructed without internal doors, floor coverings or ceilings. And, ironically, I worked for the Health Department at that time, (pause) and the municipality had to lobby the government, if they, at their own expense, could put those in to give the people a modicum of comfort.

Second Narrative:

Abstract:

Now you can imagine what this did to people who were seventy, eighty years old, who were suddenly uprooted, taken out of their (*pause*) settled areas, and then thrown into the Cape Flats. (*pause*)

Orientation 1:

You must remember now, that whole communities were being destroyed. Church organizations, (*pause*) sports clubs, schools, the whole community fabric has been destroyed. (*pause*)

Orientation 2:

When I lived here in District Six, when I lived in Bloemhof Flats, I virtually knew everybody, and everybody knew me. Walking through District Six, you could wave and greet, although you might not know a name, but the face is familiar. There's always a smile and a greeting. Even amongst the supposed-to-be gangsters. 'Cause, whenever my mother went shopping, after she came back from wor- from shops or streets, who'd be carrying her bag? Those supposed-to-be gangsters. Bring her back, bring her home, for the couple of cents they gonna get, but fact remains it was the respect that was accorded.

Complicating Action:

Suddenly I find myself in Hanover Park. (*pause*) I dunno my neighbour on my left hand side, right hand side, front of me, behind me, or above me, and even above that.

Evaluation:

We were all sitting in total isolation.

Third Narrative:

Abstract:

Now you can imagine what this did to the older folk.

Orientation 1:

You find a lot of the old folk died, and I suppose their death certificates would have said 'died of natural causes'. I always maintain those death certificates should be, relooked at, and it should say 'died of depression and broken hearts', because that is what they actually died of.

Orientation 2:

Personal friend of mine who lives out in Sea Point, Tramwell Road,

Complicating Action:
his father received his notice, read the notice, couple of days later, walked out of the front door, and they found him hanging in the trees between Sea Point and Camps Bay.

Evaluation and Result:
One of many suicides who were committed by people, because they couldn't stand the fact, that they'd been totally destroyed, their lives had been totally destroyed, because of the colour of their skin.

Appendix C

A Custom File Format for Defining Interactive Digital Storytellers & Narratives

In Chapter 5, Section 5.5.1 we briefly described the implementation of a storytelling prototype according to the design inspired by real-life storytelling at the District Six museum. We wanted the prototype to allow for narrative content and user-storyteller interactions to be easily configurable without requiring coding or recompilation. We achieved this by building the prototype as a state machine, based on Figures 5.4, 5.7, 5.8 and 5.9 in Chapter 5, where almost all the required content was defined by a series of custom-format text files parsed on start-up. This format was a key part of our prototype design and allowed us to define narratives as a collection of components which incorporated user-storyteller interactions and define story objects such that clicking on the object would trigger a particular narrative. They also allowed us to script the audio of the storyteller agent's voices together with the animations of the storyteller models and objects in the VE.

In this Appendix we describe the file format in detail starting with their basic building block, audio-animations segments in Section C.1. Overall we used two file types, with similar formats, one to define storyteller agent information (Section C.2) and, another to define the narratives' components and interactions (Section C.3).

C.1. Audio-Animation Segments and Comments

The first thing we wanted the input files to do was coordinate the storyteller agent's voices and animations. Since we had used audio from a variety of Joe and Noor's tours at the District Six Museum, the soundtrack consisted of a collection of different audio files which we wanted to put together in a logical way. Additionally we wanted the storyteller agent models' animations to match the audio. Therefore, we created what we refer to as *audio-animation segments* in order to script animations to match a particular piece of audio. Here is an example:

```
audio:NoorGMActs-1-O
00:00 sitHeadTiltRight
00:01 sitSelfGesture
00:03 sitHeadShake
00:05 sitHeadNodLeft
00:06 sitHandForwardRight
00:08 sitHeadNod
*
```

The first line indicates the name of the audio file to use for this segment. As per the XNA Game Studio framework the audio files are all wave files gathered in *wave bank*; later in this Appendix, we

will show how we defined the name and location of the wave bank. The name given after the "audio:" label above is the name of an individual wave file within a globally defined wave bank. In this case, the wave file is named "NoorGMActs-1-O"[25]. The rest of the segment gives a script of timings, relative to the start of the audio file, and animations. The animation names are part of list typically built into animated model by the modelling packing used, in this case the animations names belong to the Noor model created in Blender 3D. So this script specifies as the audio file starts to play the Noor model should play its sitHeadTiltRight animation, at the 1 second mark the sitSelfGesture animation and so forth. We aimed to give the animations descriptive names to make this scripting easier. These animations, for example, all start with the word 'sit' since they were animations performed from the Noor model's sitting position. The end of a segment is indicated by the asterisk character (*). As we will later explain, these segments define each possible length of animated speech from the storyteller agents ranging from whole narrative clauses to a short acknowledgement of a user's question.

It is also possible to script the movement of an object in the VE according to an audio snippet. We used this to create the movement of a panel at a specific point during the *Richmond Street* narrative as follows:

```
audio:JoeRichmondStr-2-CA
00:00 pointPicUpperRight
00:00 object move, x:0 y:0 z:100
00:03 pointPicMidRight
00:04 object rotate, x:0 y:200 z:0
00:05 slightBow
```

In the above excerpt, at the start of the audio snippet, the storyteller model plays the pointPicUpperRight animation and the **object move, x:0 y:0 z:100** command, translates the object associated with a narrative (each narrative may be associated with one object in the VE as we will see later) 100 units along the z-axis. And at the 4 second mark the **00:04 object rotate, x:0 y:200 z:0** command rotates the object 200 degrees around the y-axis.

We chose to define comments, which were ignored by the prototype's parser, for the file format in order to make them more readable, for our own purposes and in case the museum wished to alter the prototype's content beyond this project. Single-line comments lines were preceded by // and multi-line comments were bookended by /* and */ characters.

C.2. Storyteller Agent Files

We used one file to define the following for the storyteller agents:

- The rotation and scale of the storyteller agent models
- The audio and animations used during their greeting and introduction at the start of the VE
- A collection of acknowledgements of questions from the user and virtual audience
- A collection of responses for unrecognised user questions

[25] The names of the audio files give some idea of what part of a narrative they are. In this case the audio file comes from Noor's *Group Areas and Mixed Marriage Acts* narrative (hence the NoorGMActs abbreviation); it is the very segment of that narrative (1) and it is an orientation clause (O).

Below we give the full storyteller input file. For brevity, we have omitted the animation scripts from some of the audio-animation segments. And, for clarity, we have emphasised the beginning and endings of the file's various parts. We give the full definitions used for both the Noor and Joe storyteller agents.

Storyteller Input File:

```
begin Noor

	//Rotation in degrees
	rotation x: -90
	rotation y: 90
	rotation z: 0

	//Scale factor
	scale: 5.0

	//Names of audio resources
	xact project:NoorStoryteller
	wave bank:WaveFiles
	sound bank:Cues

	/*
	*This introduction will take place at the start of the user's -
	*experience in the VE.
	*/
	begin introduction

		audio:Intro-1-GoodMorning
		00:00 standTwoHandGesture_1
		*

		audio:Intro-2-MyNameIsNoor
		00:00 standForwardGestureR
		00:02 standHeadNod
		00:03 standSelfGesture
		00:05 standHeadNod
		*

		audio:Intro-3-IWasBornInD6
		00:00 standTwoHandGesture_2
		*

		audio:Intro-4-YouKnowOurChildren
		*

		audio:Intro-5-ImportantPartOfOurHistory
		00:00 standHeadShake
		00:03 standSelfJoeGesture
		00:05 standHeadNod
		*

	end introduction

	/*
	*The prototype will select randomly from this collection of
	*audio-animation segments when the storyteller agent is
	*acknowledging questions from the user or virtual audience.
	*/
	begin question acknowledgements

		audio:YouErHaveQuestion
```

```
        00:00 sitForLeanArmRaiseR
        *

        audio:There'sAQuestionNow
        00:00 sitForwardLeanHeadNod
        *

        audio:Yes
        00:00 sitForLeanArmRaiseR
        *

        audio:YesQuestion
        00:00 sitForLeanArmRaiseL
        *

end question acknowledgements

/*
*The prototype will select randomly from this collection of
*audio-animation segments when the storyteller agent has to
*respond to an unrecognised question from the user.
*/
begin unrecognised question responses

        audio:IDontKnow_WP
        00:00 sitHeadNod
        *

        audio:IDon'tKnowButI'llFindOut
        00:00 sitHeadShake
        00:02 sitHeadNod
        00:03 sitHandForwardR
        *

end unrecognised question responses

/*
*A collection of possible responses to questions. Each question
*here is associated with a number of keywords which are
*compared to a user's question input when trying to find the
*best response.
*/
begin question responses

question Where were you moved to?:
keywords: moved, where, live, now, move

        audio:QAns_WhereWereYouMovedTo
        //Animation script here
        *

question Did anyone refuse to leave?:

        keywords: refuse, protest, resist, leave, anyone

        audio:QAns_DidAnybodyRefuseToLeave
        //Animation script here
        *

question How many people were evicted?:

        keywords: evicted, people, number, many, total

        audio:QAns_HowManyPeopleWereEvicted
        //Animation script here
        *
```

```
	question Who was the president?:
		keywords: president, Apartheid, Nationalist, government

		audio:QAns_WhoWasThePresident
		//Animation script here
		*

	question Were/are you married?:

		keywords: married, wife, marry, husband

		audio:QAns_WereYouMarried+AreYouMarriedStill
		//Animation script here
		*

	question Do you have bitterness about what happened to you?:
	keywords: hate, bitterness, resentment, resent, angry, upset

		audio:QAns_DoYouHaveBitterness
		//Animation script here
		*

	question What happened to District Six?:
	keywords: District, six, now, happened, end, today, build, new

		audio:QAns_WhatHappenedToDistrictSix
		//Animation script here
		*

	question Did you start a new community?:
	keywords: Athlone, community, now, place

		audio:QAns_DidYouStartANewCommunity
		//Animation script here
		*

	end question responses

end Noor

begin Joe

	rotation x: -90
	rotation y: 45
	rotation z: 0

	scale: 5.0

	xact project:JoeStoryteller
	wave bank:WaveFiles
	sound bank:Cues

	begin introduction

		audio:Intro-1-Welcome
		00:00 headNod
		00:01 twoHandGesture_5
		*

		audio:Intro-2-IWasBornInD6
		00:00 twoHandSelfGesture
		00:03 distanceGestureR
		*

		audio:Intro-3-YouCanSitDown
		00:00 sitDownGesture
		00:02 shift_3
```

```
        00:04 claspAndGesture
        00:06 sitDownGesture
        *

end introduction

begin question acknowledgements

        audio:YesQuestion_AV
        00:00 distanceGestureR
        *

        audio:Yes_AC
        00:00 headNod
        *

end question acknowledgements

begin unrecognised question responses

        audio:IDunno_AC
        00:00 headShake
        *

        audio:IReallyDon'tKnow
        00:00 headShake
        *

end unrecognised question responses


begin question responses

question Where were you moved to?:

        keywords: moved, move, where, live, now, home

        audio:QAns_WhereWereYouMovedTo
        //Animation script here
        *

question Did you witness the demolition?:

        keywords: witness, demolition, demolish, destroy, see,
        watch, observe, observed, destruction, bulldozer,
        bulldozers

        audio:QAns_DidYouWitnessTheDemolition
        //Animation script here
        *

question Are you trying to reclaim land?:

        keywords: reclaim, land, back, claim

        audio:QAns_AreYouTryingToReclaimLand
        //Animation script here
        *

question How old were you?:

        keywords: old, age, year, years, when

        audio:QAns_HowOldWereYou
        //Animation script here
        *
```

```
        question How was life and community in District Six?:
               keywords: community, spirit, District, Six

               audio:QAns_HowWasCommunitySpiritAndLifeInD6
               //Animation script here
               *

        question How was life in the Cape Flats?:
               keywords: Cape, Flats, township, ghetto

               audio:QAns_HowWasLifeInTheCapeFlats
               //Animation script here
               *

        question Do you have bitterness about what happened to you?:

               keywords: angry, anger, bitterness, upset, hate,
               resentment

               audio:QAns_DoYouHaveBitterness
               //Animation script here
               *

        end question responses

end Joe
```

The beginning and end of a storyteller agent's definition is denoted by *begin <storyteller name>,* and the parser takes the supplied name as the storyteller agent's name. So in the example above, the Noor agent's definition is bookended with **begin Noor** and **end Noor**. The storyteller agent definition begins by specifying the rotation and scale that should be applied to the storyteller's model. Next are the names of the audio resources for all of the storyteller's non-narrative content. Since we used XNA game studio, the audio followed its framework which required creating a *Xact project* containing all audio as wave files in a *wave bank* and then defining a *sound bank* of cue names as handle for each wave file.

Next the greeting and introduction, given by each storyteller agent at the start of the prototype, is defined between the **begin introduction** and **end introduction** labels. It consists of a number of audio-animation segments which result in the storyteller agent speaking and moving while they welcome the user and introduce themselves. We drew the introduction audio from the different tours we had of each storyteller so that we could construct in greeting that was typical of how both guides usually greet museum visitors and useful for introducing the user to the VE. Thus, the Noor agent's introduction is comprised of five segments played consecutively.

After this, between the **begin question acknowledgements** and **end question acknowledgements** labels, is a collection of audio-animation segments used when the storyteller agents were acknowledging user questions that arose during the narratives. Most of these were very brief, requiring only one animation. Similarly, between the **begin unrecognised question responses** and **end unrecognised question responses** labels, is a collection of responses given by the storyteller agent whenever and unrecognised question was entered by the user. The Noor agent had two possible responses for this scenario: "I don't know." and "I don't know, but I'll find out!".

Finally, between the **begin question responses** and **end question responses** labels, is a collection of possible responses to user questions. This was added on the basis of the results from Studies Two and Three. The version of the prototype used there contained questions only within narratives – and those questions were specific to the narratives. However, the results of Studies Two and Three showed a very low rate of successfully answered questions. We realised that we needed to add more questions and that users often asked questions about the storyteller's personas as well as questions about the narratives. Therefore, we added this collection of question responses to the storyteller agents themselves. Each question is denoted by **question** followed by a name (used purely to help us distinguish between the questions while composing the file, we chose to formulate names in the form of the questions we thought went with the response, but they could have any name). Next to each question response's **keyword** label are a number of keywords which are compared to a user's question input when trying to find the best response. After the keywords is an audio-animation segment for the storyteller agent's response, or answer, to the question.

C.3. Narrative Content Files

The second input file defined the following information regarding the narratives, user-storyteller interactions and story objects:

- The narratives were segmented into their constituent components of which there were three types: the linear narrative clauses; and the interactive question opportunities and exchange structures.
- Audio-animations segments for each component
- The content of the user-storyteller interactions, namely: the keywords associated with questions in question opportunities and exchange structure answers; defining a questions collection for each question opportunity; storyteller agents' acknowledgments of questions and responses to unrecognised questions; and defining exchange structures' initiating questions, non-terminating and terminating answers.
- Defining links between story objects and narratives

The Basic Layout of a Narrative:

```
begin story
name:From Bloemhof Flats to Cape Flats
storyteller:Joe
object: Bloemhof Flats demolition picture
xact project:JoeBloemhofFlatsToCapeFlats
wave bank:WaveFiles
sound bank:Cues

      begin component
            orientation, linear

            audio:JoeBF2CF-1-O
            //Animation script here
            *

      end component

      begin component
            complicating action, linear
```

```
        audio:JoeBF2CF-2-CA
        //Animation script here
        *
end component

begin component
        evaluation+result_part1, linear

        audio:JoeBF2CF-3-E+R_1
        //Animation script here
        *
end component


begin component
        evaluation+result_part2, linear

        audio:JoeBF2CF-4-E+R_2
        //Animation script here
        *
end component

//more components

begin question responses

question Did a lot of people get diseases?:
        keywords: diseases, illness, disease, sick, people, many

        audio:QAns_DiseasesFromCapeFlatsHousing
        //Animation script here
        *

question Who was the parking lot for?:
        keywords: parking, cars, replaced, lot

        audio:QAns_WhoWasTheParkingLotFor
        //Animation script here
        *

question How many people lived in Bloemhof Flats?:
        keywords: Bloemhof, people, many, lived, tenants

        audio:QAns_HowManyPeopleLivedInBloemhofFlats
        //Animation script here
        *

end question responses

end story
```

The beginning and ending of a narrative definition were denoted by **begin story** and **end story**, respectively. The beginning of a narrative definition includes some overall details with specific labels: the **name**; which storyteller agent is to tell that narrative (**storyteller**); the **object** label associates the narrative with an object in the VE, which is optional; and the location of the narratives audio files (**xact project**, **wave bank** and **sound bank**).

Our design conceptualised narratives as comprised of different components of different kinds: linear narrative clauses whose content was static and interactive question opportunities and exchange structures. Therefore, our format split narratives up into its constituent components. Each component is enclosed by **begin component** and **end component**. The first line of each components

contains two pieces of information: a name and the type. In our work the name matches the name of that component in the narrative's structure but it does not influence how the component is handled by the prototype and could be named anything. In the excerpt above, for example, the first component's name is 'orientation' because it is the narrative's orientation as per our structural analysis of Joe's *From Bloemhof Flats to Cape Flats* narrative. The type of the component, however, influences how it is handled. The above excerpt shows only `linear` components; these are narrative clauses which are linear in the sense that they are non-interactive and static (i.e. they are the same each time they are 'played'). These components consist of one or more of the audio-animation segments described in the previous section. Allowing more than one segment like this allowed us to used different recordings to make up a narrative clause so that we could combine the clearest recordings from Joe and Noor's tours. If there is more than one segment, they are played sequentially. The interactive component's type was either marked as `question opportunity` or exchange `structure` and each had their own format, which we describe later. Finally, if we had additional recordings of the guides answering questions related to the narrative, we added a reserved of question responses at the end of the narrative definition, exactly like that defined in the storyteller input file.

Question Opportunity Components:
The following excerpt shows a question opportunity at the end of the Noor agent's *Family History and Home* narrative:

```
begin component
        family home questions, question opportunity

        invitations:
                audio:Noor_IfYouHaveAnyQuestions
                00:01 sitHandRaiseL
                00:03 sitDeepHeadNod
                *

        question acknowledgements:

                audio:NoorFamilyHouse-17-QO_Q1noticed
                00:00 sitForLeanArmRaiseR
                *

                audio:NoorFamilyHouse-17-QO_Q2noticed
                00:00 sitForLeanArmRaiseL
                *

        question 1, specific:
                keywords: born, also, child, house

                audio:NoorFamilyHouse-17-QO_Q1asked
                *

                audio:NoorFamilyHouse-17-QO_Q1response
                00:00 sitHeadNod
                00:01 sitChinForward_Pt1
                00:02 sitChinForward_Pt2
                00:03 sitHandShowsFour
                *

        question 2, general:
                keywords: come, back, move, build, again

                audio:NoorFamilyHouse-17-QO_Q2asked
```

```
            *

            audio:NoorFamilyHouse-17-QO_Q2response
            00:00 sitHeadShake
            00:02 sitDeepHeadNod
            00:04 sitHandRaiseL
            *

      end question opportunity
end component
```

Question opportunities could be initiated by a storyteller agent inviting the user and virtual audience to ask questions or by a virtual audience member asking a question. So, in the case of the former, a question opportunity began with defining one or more audio-animation segments to use when the storyteller agent was prompting for questions. These are listed under the **invitations** label. Next, a list of audio-animation segments to use when the storyteller agent was acknowledging a question from the user or virtual audience – much like that defined in the storyteller input file earlier. After this there follows a list of the question opportunity's questions, similar to the questions in the storyteller input file. Each question is denoted by a question name (**question 1** and **question 2** in the above excerpt) and is categorized as either **specific** or **general**. The former means the question is specific to the current narrative. When a questions opportunity needed to search beyond its own collection of questions, in other question opportunities, for a match to a user's question, specific questions could be ignored since and question's answer would not make sense delivered during another narrative. Meanwhile general questions could be answered from other narratives and still make sense. Like the question described earlier, there is a list of keywords used to compare to user's question input. Additionally, the questions defined within question opportunities contained two audio-animation segments (whereas the ones is the storyteller input file had one). The first is used to play audio of a virtual audience asked the question and the second is used to play the storyteller agent's response to the question. The end of a question opportunity is indicated by **end question opportunity**.

Exchange Structures:

At the end of the Noor agent's *Family History and Home* narrative, right after Noor had described witnessing the demolition of his District Six home, there is an exchange structure initiated by the Noor agent asking "What do you think? How did I feel?". If the user types "sad", he responds with "Sad" and waits for another answer. If the user types "angry", the correct answer, he responds "Angry! That's the word! I was so angry!" and the interaction ends. If the user types anything else, he responds "No, try again." and waits for another answer. The excerpt below shows input file excerpt defining this exchange structure:

```
begin component
      evaluation, exchange structure

      initiate:
            audio:NoorFamilyHouse-14-E_ES_Initiate
            00:01 sitHandForwardEmphR
            *

      answer 1:
            keywords: sad, depressed, heartbroken, heart, unhappy,
            disappointed, upset
```

```
        audio:NoorFamilyHouse-14-E_ES_Ans1
        *
        audio:NoorFamilyHouse-14-E_ES_Ans1Response
        00:00 sitHeadNodR
        *

    final answer:
        keywords: angry, furious, mad, rage, enraged

        audio:NoorFamilyHouse-14-E_ES_AnsCorrect
        *

        audio:NoorFamilyHouse-14+15-E_ES_AnsCorrectResponse
        00:00 sitRapidArmRaiseLeft
        00:01 sitDeepHeadNod
        00:03 sitHeadShake
        00:04 sitHeadTiltRight
        00:05 sitHandRaiseLeft
        *

    unrecognised input responses:
        audio:NoTryAgain
        00:00 sitRapidArmRaiseLeft
        *

    end exchange structure

end component
```

Exchange structures began by defining an audio-animation segment to serve as the initiating question, posed by the storyteller agent. Next, is a list of one or more non-terminating answers, followed by the terminating answer. The above exchange structure had only one correct, or terminating, answer. The format for exchange structure answers were similar to that if individual questions. They were associated w set of keywords (used to compare to the users answer attempts when searching for an answer that matched their input), an audio-animation segment of an audience member saying that answer and an audio-animation segment of the storyteller responding to that answer. After defining the exchange structure's answers, under the **unrecognised input responses** label is a list of one or more audio-animation segments used when the user enters an unrecognised answer attempt (in this case the "No, try again." response in this example). The following excerpt from the Group Areas and Mixed Marriages Acts narrative definition shows an exchange structure in which the Noor agent asks for the names of some Cape Town townships where people classified as black were made to live:

```
begin component

    orientation_part6_es2, exchange structure

    initiate:
        audio:NoorMMAct-15-O_6_ES2_Initiate
        00:00 sitRapidArmRaiseL
        00:01 sitTwoHandGesture
        *

    answer 1:
        keywords: soweto, soweeto, showeto

        audio:NoorMMAct-16-O_6_ES2_Ans1
        *

        audio:NoorMMAct-16-O_6_ES2_Ans1Response
```

```
            00:00 sitHeadShake
            *

      answer 2:
            keywords: gugulethu, guguletu, gugs, gugu, gug

            audio:NoorMMAct-17-O_6_ES2_Ans2
            *

            audio:NoorMMAct-17-O_6_ES2_Ans2Response
            00:00 sitHeadNodR
            *

      answer 3:
            keywords:   khayelitsha,   khaye,   khayeletsa,   khaylitsha,
            khayletsha, khayelitcha, khayeletcha, khayelecha, kayelitsha,
            kayeletsha

            audio:NoorMMAct-18-O_6_ES2_Ans3
            *

            audio:NoorMMAct-18-O_6_ES2_Ans3Response
            00:00 sitHeadTiltL
            00:01 sitRapidArmRaiseR
            00:04 sitTwoHandGestureEmph
            00:07 sitHandForwardEmphL
            *

      answer 4:
            keywords: nyanga, nyana, njanga, nanga

            audio:NoorMMAct-19-O_6_ES2_Ans4
            *

            audio:NoorMMAct-19-O_6_ES2_Ans4Response
            00:00 sitHeadNodL
            *

      final answer:
            keywords: langa, longa, lang, long, lunga, lung

            audio:NoorMMAct-20-O_6_ES2_FinalAns
            *

            audio:NoorMMAct-20-O_6_ES2_FinalAnsResponse
            00:00 sitHeadNodR
            00:01 sitHandForwardR
            00:03 sitHandRaiseR
            00:06 sitHeadTiltR
            *

      unrecognised answer responses:
            audio:YesTryAgain
            00:00 sitHeadNodRight
            *

      end exchange structure

end component
```

Appendix D

Studies Two & Three

This appendix contains materials used in Studies Two and Three, in the order that participants encountered them. Section D.1 gives the consent form completed by participants before beginning the study. Section D.2 shows the navigational controls made available to participants during the studies. Section D.3 gives the self-report questionnaire completed by participants after experiencing the prototype. And, D.4 summarises nationality, hometown and race data from the sample.

D.1. Consent Form

This consent form gave participants some brief information about the topic of the studies and that the studies had been approved by our university's ethics board. They were also informed that they would be participating anonymously, could end their participation at any time, would be paid for their participation and could request follow up information about the studies.

UNIVERSITY OF CAPE TOWN

Consent Form for Participation in District Six Storytelling Study

This study is part of research being done at the University of Cape Town in the Department of Computer Science.

The study involves stories about District Six and Apartheid-era forced home removals. These stories will be presented in a simulated 3D environment using a standard personal computer. After experiencing the stories you will be asked to complete a questionnaire. A detailed description of this study has been considered and approved by the University of Cape Town's Research Ethics Board and Student Affairs.

By signing this consent form you indicate your awareness that:

- Your identity will not be recorded and, therefore, responses remain anonymous.
- You may terminate your involvement in the study at any time.
- You are being paid R50 for your completed participation.
- You have the right to request information about the study's outcomes at a later stage.

Full Name: _____

Signature: _____

If you require any more information regarding this study, please feel free to contact Ilda Ladeira on e-mail iladeira@cs.uct.ac.za.

D.2. Navigational Controls

Before using the prototype, participants were trained in how to use the mouse and keyboard to exploring the forthcoming VE as well as all the controls required for the interactions included in their experimental condition. In case they needed a reminder of the navigational controls while using the VE, we provided a page with the Table D.1 printed on it:

Right-handed	**Left-handed**
W – move forward	**↑ –** move forward
S – move back	**↓ –** move back
A – look left	**← –** look left
D – look right	**→ –** look right
Right Shift – sit down	**Right Shift –** sit down

Table D.1 Participants were provided with a page to keep while using the prototype which reiterated the VE's navigational controls as shown above.

D.3. Questionnaire

This questionnaire gathered demographic, control, story experience and qualitative data in the following order: demographic information; qualitative feedback; a series of Likert-type items to measure the existing knowledge, interest tendency and story experience (in this section we indicated what each item measured); a section where participants indicated whether they had visited the District Six Museum or studied District Six at school; a section allowing for open-ended comments regarding their experience of the prototype.

District Six Storytelling Study Questionnaire

Please fill in the following details:

Age: _____

Year of Study: _____

Faculty in which you are registered: _____

Nationality: _____

Race: _____

Hometown (place where you grew up): _____

Please circle your gender: Gender: Male / Female

The following questionnaire relates your experience of the stories which has just been presented to you. Please answer the questions in the order in which they appear. Do not to skip any questions or return to a previous question to change your answer. There are no right or wrong answers and your answers will not be used as a reflection of you or your abilities since all questionnaires in this study will be filled in anonymously. You will notice that some questions are very similar to each other. This is necessary for statistical reasons.

Which story did you enjoy the most and why?

_____

_____

_____

_____

Which storyteller did you enjoy the most and why?

_____

_____

_____

_____

List any things about the storytelling environment that you liked:

_____

_____

_____

_____

List any things about the storytelling environment that you <u>did not</u> like:

_____

_____

_____

_____

In the following questions, please indicate the answer which most applies to you by circling the appropriate number. Circling a 7 means that the statement fully applies to you and circling a 1 indicates that the statement does <u>not</u> apply to you at all. Remember to consider the entire scale when making your response since the numbers between 1 and 7 may also apply to you.

1. I enjoy hearing/reading personal stories about historical events. ***(Interest Tendency)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

2. I enjoy hearing/reading about South Africa's history. ***(Interest Tendency)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

3. I would like to hear/read more forced removal and District Six stories like the ones today. ***(Interest)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

4. Reading a book about the forced removals would be very little fun for me. ***(Interest; reverse item)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

5. I had never heard of District Six before today. ***(Existing Knowledge)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

6. Before today, I knew quite a bit about the forced removals that took place during Apartheid. ***(Existing Knowledge)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

7. I would not be interested in going to an exhibit or museum about District Six. ***(Interest; reverse item)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

8. I would like to find out more about District Six. ***(Interest)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

9. I would enjoy watching a film about District Six. ***(Interest)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

10. At a library, I would look for books with more information about District Six and forced removals. ***(Interest)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

11. I had not heard / read any District Six stories before today. ***(Existing Knowledge; reverse item)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

12. I enjoy learning about South Africa's history. ***(Interest Tendency)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

13. I think South African history is very interesting. ***(Interest)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

14. I would not enjoy watching a video based on District Six. ***(Interest; reverse item)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

15. I would like to find out more about Apartheid and/or forced removals. ***(Interest)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

16. I found the stories confusing. ***(Confusion)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

17. I enjoyed my experience of the stories. ***(Enjoyment)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

18. I felt like I was listening to real-life storytelling. ***(Storytelling Realism)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

19. I found the stories boring. ***(Boredom)***

1 2 3 4 5 6 7
FULLY DISAGREE FULLY AGREE

20. I <u>did not</u> enjoy the stories. ***(Enjoyment; reverse item)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

21. The stories held my attention. ***(Attention)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

22. I <u>did not</u> understand the stories. ***(Confusion)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

23. I <u>did not</u> pay much attention to the storytellers. ***(Attention; reverse item)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

24. The stories were hard to follow. ***(Confusion)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

25. During the storytelling I experienced boredom. ***(Boredom)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

26. I would characterise my experience of the stories as fun. ***(Enjoyment)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

27. I would characterise my experience of the stories as captivating. ***(Boredom; reverse item)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

28. I spent most of the time looking at the storytellers. ***(Attention)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

29. The storytellers seemed like real people. ***(Storytelling Realism)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

30. The storytelling did not seem realistic to me. ***(Storytelling Realism)***

1 2 3 4 5 6 7

FULLY DISAGREE FULLY AGREE

*Answer the following two questions about yourself by circling **Y** for Yes and **N** for No.*

Have you ever visited the District Six Museum in Cape Town? **Y / N**

At school, did you cover a book about District Six as part of one of your subjects? **Y / N**

Finally, list any general comments you may have about the storytelling environment and/or the stories you experienced today:

_____

_____

_____

Nationality		***Hometown***		***Race***	
South Africa	106	Western Cape Province	38	Black	79
Zimbabwe	25	Limpopo Province	8	White	39
Namibia	1	Gauteng Province	21	Coloured	12
Kenya	3	Eastern Cape Province	12	Asian	5
Tanzania	2	Mpumalanga Province	5	Indian	2
Botswana	1	Kwazulu Natal Province	17	Xhosa	1
Lesotho	1	South Africa	5	Zulu	1
Congo	1	Other African town	33	Other	6
Mauritius	1	European	2		
Ireland	2	American	1		
Sweden	1				
United States of America	1				

Table D.2 A summary of the nationality, hometown and race data in Studies Two and Three's samples combined.

D.4. Nationality, Hometown & Race Data

We collected a range of demographic data, which we thought might affect participants' response to the prototype and its Apartheid-themed content: current year of study, faculty, age, gender, nationality, hometown and race. This section shows the data for the latter three which were classified as shown in Table D.2 below. Hometowns were categorised as follows: South African hometowns were classified according to the provinces in which they were located; there was a "South Africa" category for those who listed their hometown as South Africa; "Other African town" comprised hometowns from other African countries; European and American hometowns made up the "European" and "American" categories, respectively. Regarding race, our questionnaire did not impose a selection of available options, but allowed participants to identify themselves as they wished. Most chose to use classical racial categories such as "Black", "White" and "Coloured". A small number chose not to identify their race by skin colour entering responses such as "Other" or, even "Hybrid"; all these types of responses were gathered into a category entitled "Other". Four participants specified ethnicities such as "Indian", "Xhosa" and "Zulu".

Appendix E

Study Four

This appendix relates to Study Four, where we deployed our storytelling prototype as an exhibit at the District Six Museum to evaluate how visitors reacted to and used it. In preparation for Study Four, we made improvements to the prototype based on the results of Studies Two and Three. The main change was an attempt to improve the storyteller agents' question-answering capabilities by expanding their question repertoires. Section E.1 gives the question repertoires of both storyteller agents. Section E.2 describes the control descriptions that were made available to the visitors while using the prototype. And, Section E.3 gives the feedback forms that visitors completed voluntarily after using the prototype.

E.1. Storyteller Agents' Question Repertoires

The prototype's two storyteller agents each had a repertoire of questions they could answer. In Studies Two and Three the Noor agent's repertoire consisted of six questions while the Joe agent could answer three questions. One of the outcomes of Studies Two and Three was that these repertoires were too limited and a large proportion of user's questions were not answered successfully. Hence, in preparation for Study Four, we expanded the question repertoires to each agent to fifteen questions. We chose which questions to include by inspecting usage logs from Studies Two and Three to find which questions were asked most often and recording Joe and Noor answering those questions.

Here we give the questions in the storyteller agents' repertoires. For each agent we indicate which questions comprised their repertoire in Studies Two and Three and which were added for Study Four. Additionally, we indicated which questions were specific to particular narratives.

The Noor agent:
Original question repertoire used in Studies Two and Three:

1. How could the Apartheid government separate families? (narrative-specific; *Group Areas and Mixed Marriages Acts*)
2. Do the married couple live together now? (narrative-specific; *Group Areas and Mixed Marriages Acts*)
3. If people of two different races were legally married, would they have been separated? (narrative-specific; *Group Areas and Mixed Marriages Acts*)
4. How old were you when you left District Six?
5. Were you also born in your grandfather's house? (narrative-specific; *Family History and Home*)
6. Do you want to move back to District Six?

Questions added for Study Four:

7. Where were you moved to?
8. Did your grandfather remember your name? (narrative-specific; *Family History and Home*[26])
9. Did anybody refuse to leave District Six?
10. How many people were evicted from District Six?
11. Who was the president during Apartheid?
12. Are you married?
13. Do you hate white South Africans now?
14. What happened to District Six?
15. Did you settle into a new community after leaving District Six?

The Joe agent:
Original question repertoire used in Studies Two and Three:

1. Was there a conspiracy to cover up suicides that resulted from evicting people? (narrative-specific; *From Bloemhof Flats to Cape Flats*)
2. Are the District Six streets still there or are they also gone?
3. Who owns the District Six land now?

Questions added for Study Four:

4. Where were you moved to?
5. Did you witness the demolition?
6. Are you trying to reclaim land in District Six?)
7. Did a lot of people fall ill from living in Cape Flats housing? (narrative-specific; *From Bloemhof Flats to Cape Flats*)
8. How old were you?
9. How was life in the Cape Flats?
10. Are there many District Six streets still buried under rubble? (narrative-specific; *Richmond Street*)
11. Do you have bitterness towards white South Africans?
12. Is the Moravian Church still there? (narrative-specific; *Richmond Street*)
13. Who was the parking lot for? (narrative-specific; *From Bloemhof Flats to Cape Flats*[27])
14. How many people lived in Bloemhof Flats? (narrative-specific; *From Bloemhof Flats to Cape Flats*)
15. What was the District Six community like?

[26] This question most likely arose often since, in the narrative, Noor tells of how his grandfather had so many children and grandchildren that he could not remember all their names.
[27] In this narrative Joe mentions that his former home, the Bloemhof Flats building, was demolished to build a parking lot.

E.2. Prototype Controls

Before using the prototype, the display presented museum visitors with a set of slides describing how to use the mouse and keyboard to exploring the forthcoming VE as well as how to ask questions, participate in exchange structures and trigger narratives using story objects. In case they needed a reminder of these controls while using the prototype, we placed a page next the computer which reiterated the navigational controls and the slides related to questions, exchanges structures and story objects. The contents of this page are shown in Figure E.1 below.

Right-handed	**Left-handed**
W – move forward	↑ – move forward
S – move back	↓ – move back
A – look left	← – look left
D – look right	→ – look right
Right Shift – sit down	**Right Shift –** sit down
Space bar – ask a question	
Typing box: Type and press **Enter**. If you decide not a ask or answer a question, press **Escape**	

Figure E.1 The contents of a page, placed next to the computer used in Study Four, which reminded visitors at the exhibit of the VE's navigational controls and how to ask questions, participate in exchange structures and trigger narratives using story objects.

E.3. Feedback Form

This feedback form, which museum visitors completed voluntarily, gathered basic demographic information, a one-item rating for each aspect of story experience (which have indicated which aspect each item related to below) and open-ended comments regarding the prototype:

Tell us what you think!

Age: _____

Gender: Male / Female *(circle one)*

Nationality: _____

Please indicate the answer which most applies to you by circling the appropriate number. Circling a 7 means that the statement fully applies to you and circling a 1 indicates that the statement does not apply to you at all. Be honest!

31. I would like to find out more about District Six. ***(Interest)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

32. I enjoyed my experience of the stories. ***(Enjoyment)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

33. I felt like I was listening to real-life storytelling. ***(Storytelling Realism)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

34. I would characterise my experience of the stories as captivating. ***(Engagement)***

1	2	3	4	5	6	7
FULLY DISAGREE						FULLY AGREE

General comments about the exhibit you experienced today:

_____

_____

_____

References

Abowd, G. D. et al., 1997. Cyberguide: A Mobile Context-Aware Tour Guide. *Wireless Networks,* 3(5), pp. 421-433.

Adabala, N. et al., 2010. *An Interaction Multimedia Framework for Digital Heritage Narratives.* s.l., ACM, pp. 1445-1448.

Adams, A., 2005. *How Do We Build This Thing? Imagining Frameworks for Personal Narratives.* Strasbourg, France, Springer-Verlag, pp. 199-208.

Anastasi, A., 1982. *Psychological Testing.* New York: Macmillian.

Anon., 2012. *District Six Museum.* [Online]
Available at: http://www.districtsix.co.za/
[Accessed 4 October 2012].

Arnott, E., Hastings, P. & Allbritton, D., 2008. Research Methods Tutor: Evaluation of a dialogue-based tutoring system in the classroom. *Behaviour Research Methods,* 40(3), pp. 694-698.

Bakhtin, M., 1986. *Speech Genres and Other Late Essays.* Austin: University of Texas Press.

Barrenho, F., Romão, T., Martins, T. & Correia, N., 2006. *InAuthoring environment: interfaces for creating spatial stories and gaming activities.* s.l., ACM.

Bauman, R., 1986. *Story, Performance, and Event: Contextual studies of oral narrative.* s.l.:Cambridge University Press.

BBC, 2008. *A Guide to Digital Storytelling by members of the BBC Capture Wales / Cipolwg ar Gymru team.* [Online]
Available at:
http://www.bbc.co.uk/wales/audiovideo/sites/yourvideo/pdf/aguidetodigitalstorytelling-bbc.pdf
[Accessed 6 October 2012].

BBC, 2009. [Online]
Available at: http://www.bbc.co.uk/wales/audiovideo/sites/galleries/pages/capturewales.shtml
[Accessed 6 October 2012].

Bidwell, N. J. & Ladeira, I., 2008. *Digital Storytelling Design Learning from Non-digital Narratives: Two Case Studies in South Africa.* East London, OHASA (Oral History Association of South Africa).

Bidwell, N. J., Reitmaier, T., Marsden, G. & Hansen, S., 2010. *Designing with Mobile Digital Storytelling in rural Africa.* Atlanta, USA, ACM, pp. 1593-1602.

Bimber, O., Miguel Encarnação, L. & Schmalstieg, D., 2003. *The Virtual Showcase as a New Platform for Augmented Reality Digital Storytelling.* s.l., ACM.

Blake, E. H. & Ladeira, I., 2011. Cultural reinterpretation and resonance: The San and hip-hop. *Computers & Graphics,* 35(2), p. 383–391.

Bohus, D. & Rudnicky, A. I., 2009. The RavenClaw Dialog Management Framework: Architecture and Systems. *Computer Speech and Language,* 23(3), pp. 332-361.

Bordwell, D. & Thompson, K., 2004. *Film Art.* 7th ed. New York: McGraw Hill.

Braun, N., 2006. Storytelling & Conversation to Improve the Fun Factor in Software Applications. In: M. Blythe, K. Overbeeke, A. Monk & P. Wright, eds. *Funology, From Usability to Enjoyment.* s.l.:Springer Netherlands, pp. 233-241.

Brooks, K. M., 1996. *Do Story Agents Using Rocking Chairs?.* s.l., ACM Press, pp. 317-328.

Brown, S., Ladeira, I., Winterbottom, C. & Blake, E. H., 2003. *The Effects of Mediation in a Storytelling Virtual Environment.* Toulouse, France, Springer Berlin / Heidelberg.

Cavazza, M., Charles, F. & Mead, S. J., 2002. *Interacting with Virtual Characters in Interactive Storytelling.* Bologna, Italy, ACM, pp. 318-325 .

Cavazza, M. & Pizzi, D., 2006. *Narratology for Interactive Storytelling: A Critical Introduction.* Darmstadt, Germany, Springer-Verlag, pp. 72-83.

Chafe, W., 1998. Things We Can Learn From Repeated Tellings of the Same Experience. *Narrative Inquiry,* 8(2), pp. 269-285.

Clarke, A. & Mitchell, G., 2001. *Film and the Development of Interactive Narrative.* Avignon, France, Springer Berlin / Heidelberg.

Cohen, E., 1985. The Tourist Guide: The Origins, Structure and Dynamics of a Role. *Annals of Tourism Research,* 12(1), pp. 5-29.

Cook, G., 1989. *Discourse.* s.l.:Oxford University Press.

Cronbach, L. J., 1951. Coefficient Alpha and the Internal Structure of Tests. *Psychometrika,* 16(3), pp. 297-334.

Cronbach, L. J., 1990. *Essentials of psychological testing..* New York: Addison Wesley.

Danks, M. et al., 2007. *Interactive Storytelling and Gaming Environments for Museums: The Interactive Storytelling Exhibition Project.* Hong Kong, China, Springer Berlin / Heidelberg.

Dautenhahn, K., 1998. *Story-Telling in Virtual Environments.* Brighton, UK, s.n.

De Angeli, A., Sutcliffe, A. & Hartmann, J., 2006. *Interaction, Usability and Aesthetics: What Influences Users' Preferences?.* s.l., ACM.

Dourish, P., 2001. Seeking a Foundation for Context-Aware Computing. *Human-Computer Interaction,* 16(2-4).

Dow, S. et al., 2007. *Presence and Engagement in an Interactive Drama.* s.l., ACM.

Ebrahim, N., 2009. *Noor's Story: My Life in District Six.* Charlesville: IM Publishing.

Fetterman, D. M., 1998. *Ethnography, Step by Step.* 2nd ed. Thousand Oaks(California): SAGE Publications Inc..

Fortune, L., 2001. *The house in Tyne Street: Childhood Memories of District Six.* Cape Town: Kwela Books.

Frank, A., 1947. *The Diary of a Young Girl.* s.l.:Everyman's Library.

Frank, A., 1995. *The Wounded Storyteller: Body, Illness, and Ethics.* s.l.:University of Chicago Press.

Freedman, R., 2000. *Plan-Based Dialogue Management in a Physics Tutor.* s.l., ACM, pp. 52-59.

Frohlich, D. & Murphy, R., 2000. The Memory Box. *Personal Technologies,* 4(4), pp. 238-240.

Ghiani, G., Paternò, F., Santoro, C. & Spano, L. D., 2009. UbiCicero: A Location-aware, Multi-device Museum Guide. *Interacting with Computers,* 21(4), p. 288–303.

Graesser, A., Chipman, P., Haynes, B. C. & Olney, A., 2005. AutoTutor: An Intelligent Tutoring System With Mixed-Initiative Dialogue. *Transactions on Education,* 48(4), pp. 612-618.

Graesser, A., Wiemer-Hastings, K., Wiemer-Hastings, P. & Kreuz, R., 1999. AutoTutor: A simulation of a human tutor. *Cognitive Systems Research,* 1(1), pp. 35-51.

Graesser, A. et al., 2000. Using Latent Semantic Analysis to Evaluate the Contributions of Students in AutoTutor. *special issue of Interaction Learning Environments,* 8(2), pp. 129-148.

Green, L. J. F., 2007. Cultural heritage, archives & citizenship: reflections on using Virtual Reality for presenting knowledge diversity in the public sphere. *Critical Arts: South-North Cultural and Media Studies,* 21(2), pp. 308-320.

Hayes, P. & Reddy, R., 1983. Steps Toward Graceful Interaction in Spoken and Written Man-Machine Communication. *International Journal of Man-Machine Studies,* Volume 19, pp. 231-284.

Hayes-Roth, B., 1999. Getting into the Story. *Style,* 33(2), pp. 246-266.

Howell, D. C., 1987. *Statisical Methods for Psychology.* Boston: PWS Publishers, Wadsworth Inc..

Hughes, J., King, V., Rodden, T. & Andersen, H., 1994. *Moving Out From the Control Room: Ethnography in System Design.* s.l., ACM, pp. 429-439 .

Hughes, J., King, V., Rodden, T. & Andersen, H., 1995. The Role of Ethnography in Interactive Systems Design. *Interactions,* 2(2), pp. 56-65.

Hutchinson, H. et al., 2003. *Technology probes: inspiring design for and with families.* s.l., ACM, pp. 17-24 .

IJsselsteijn, W. A., de Ridder, H., Freeman, J. & Avons, S. E., 2000. *Presence: Concept, determinants and measurement.* s.l., s.n., pp. 3959-76.

Iqbal, R., Gatward, R. & James, A., 2005. *A General Approach to Ethnographic Analysis for Systems Design.* s.l., ACM, pp. 34-40.

Johnson, A. et al., 2002. Virtual Harlem. *IEEE Computer Graphics and Applications,* 22(5), pp. 61-67.

Johnson, A. et al., 1998. *The NICE Project: Learning Together in a Virtual World.* Atlanta, USA, IEEE, pp. 176-183.

Jones, M. et al., 2008. *"Narrowcast Yourself": Designing for Community Storytelling in a Rural Indian Context.* Cape Town, South Africa, ACM, pp. 369-378.

Jones, M., Harwood, W., Buchanan, G. & Lalmas, M., 2007. *StoryBank: An Indian Village Community Digital Library.* Vancouver, Canada, ACM, pp. 257-258.

Katriel, T., 1997. *Performing the Past: A Study of Israeli Settlement Museums.* London: Lawrence Erlbaum Associates, Publishers.

Katz, S. D., 1991. *Film Directing Shot by Shot: Visualising from Concept to Screen.* Studio City, CA: Michael Wiese Productions.

Kintz, B. L. et al., 1965. The Experimenter Effect. *Psychological Bulletin,* 63(4), pp. 223-232.

Kumar, R. & Rosé , C. P., 2011. Architecture for Building Conversational Agents that Support Collaborative Learning. *Transactions on Learning Technologies,* 4(1).

Labov, W., 1972. The Transformation of Experience in Narrative Syntax. In: *Language in the Inner City: Studies in the Black English Vernacular.* Philadelphia: University of Philadelphia Press, pp. 354-396.

Labov, W., 2010. Narratives of Personal Experience. In: P. C. Hogan, ed. *Cambridge Encyclopedia of the Language Sciences.* s.l.:Cambridge University Press, pp. 546-548.

Ladeira, I., 2005. *Story Experience in a Virtual San Storytelling Environment: A Cultural Heritage Application for Children and Young Adults.* University of Cape Town: MSc. Dissertation.

Ladeira, I. & Blake, E. H., 2004. *Virtual San Storytelling for Children: Content vs. Experience.* Brussels, s.n., pp. 223-231.

Ladeira, I. & Nunez, D., 2007. *Story worlds and virtual environments: Learning from oral storytelling.* Barcelona, Spain, ISPR, pp. 257-264.

Lim, M. J. & Aylett, R., 2007. *Feel the Difference: A Guide with Attitude!.* Paris, France, Springer Berlin / Heidelberg.

Lim, M. J., Aylett, R. & Jones, C. M., 2005. *Affective Guide with Attitude.* Beijing, China, Springer Berlin / Heidelberg.

Livo, N. J. & Rietz, S. A., 1986. *Storytelling, Process and Practice.* Littleton, Colorado: Libraries Unlimited Inc..

Lombard, M. & Ditton, T., 1997. At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communications,* Volume 3.

Madej, K., 2003. Towards Digital Narrative of Children: From Education to Entertainment: A Historical Perspective. *ACM Computers in Entertainment,* 1(1).

Marsden, G. et al., 2010. Digital Storytelling in Africa. *International Journal of Computing,* 9(3), pp. 257-265.

Martin, J. & Plum, G. A., 1997. Construing Experience: Some Story Genres. *Journal of Narrative and Life History,* 7(1-4), pp. 299-308.

Martin, J. R. & Rose, D., 2003. Ideation: representing experience. In: *Working with Discourse: Meaning beyond the clause.* London/New York: Continuum.

Mateas, M. & Stern, A., 2005. *Structuring Content in the Façade Interactive Drama Architecture.* s.l., AAAI Press, p. 93–98.

Mayfield, E. & Rosé, C. P., 2012. LightSIDE: Open Source Machine Learning for Text Accessible to Non-Experts . In: *Handbook of Automated Essay Grading.* s.l.:s.n.

Maynes, M. J., Pierce, J. L. & Laslett, B., 2008. *Telling Stories: The use of Personal Narrative in the Social Sciences and History.* s.l.:Cornell University Press.

Mishler, E., 2006. Narrative & Identity: The double arrow of time. In: *Discourse and Identity.* s.l.:Cambridge University Press.

Monk, A. et al., 1993. *Mixing Oil and Water?: Ethnography versus Experimental Psychology in the Study of Computer-Mediated Communication.* s.l., ACM, pp. 3-6 .

Moraes, M. C., Bertoletti, A. C. & da Rocha Costa, A. C., 1999. *Virtual Guides to Assist Visitors in the SAGRES Virtual Museum.* s.l., Computer Science Society.

Norrick, N. R., 2000. Chapter 4 Retelling and Retold Stories. In: *Conversational Narrative: Storytelling in Everyday Talk.* Amsterdam/Philadelphia: John Benjamins Publishing Company, pp. 69-101.

Nunnally, J. C., 1978. *Psychometric Theory.* New York: McGraw–Hill.

Ochs, E. & Capps, L., 2001. *Living Narrative: Creating Lives in Everyday Storytelling.* Cambridge, MA: Harvard University Press.

Parkington, J., 2003. *Cederberg Rock Paintings.* Cape Town: Creda Communications.

Pausch, R. et al., 1996. *Disney's Aladdin: First Steps Toward Storytelling in Virtual Reality.* s.l., ACM, pp. 193-203.

Polanyi, L., 1989. *Telling the American Story: A Structural and Cultural Analysis of Conversational Storytelling.* Cambridge, MA: MIT Press.

Portelli, A., 1991. *The Death of Luigi Trastulli and Other Stories: Form and Meaning in Oral History.* New York: State University of New York Press.

Pridham, F., 2001. *The Language of Conversation.* London and New York: Routledge.

Propp, V., 1968. *Morphology of the Folktale.* Austin and London: University of Texas Press.

Ricoeur, P., 1980. Narrative Time. *Critical Inquiry,* 7(1), pp. 169-190.

Riedl, M., 2006. From Linear Story Generation to Branching Story Graphs. *IEEE Computer Graphics and Applications,* 26(3), pp. 23-31.

Riedl, M., Saretto, C. J. & Young, R. M., 2003. *Managing interaction between users and agents in a multi-agent storytelling environment.* Melbourne, Australia, ACM, pp. 741-748.

Riedl, M. & Young, R. M., 2003. *Character-Focused Narrative Generation for Execution in Virtual Worlds.* Toulouse, France, Springer Berlin / Heidelberg.

Rosé, C. P. et al., 2003. *Exploring the Effectiveness of Knowledge Construction Dialogues.* s.l., s.n.

Rosé, C. P. et al., 2003. *The Role of Why Questions in Effective Human Tutoring.* s.l., s.n.

Rosé, C. P. & VanLehn, K., 2005. An Evaluation of a Hybrid Language Understanding Approach for Robust Selection of Tutoring Goals. *International Journal of AI in Education,* 15(4).

Rosenthal, R., 1964. The Effect of the Experimenter on the Results of Psychological Research. *Bulletin of the Maritime Psychological Association,* 13(1), pp. 1-39.

Sacks, H., 1992. *Lectures on Conversation Volume II.* Cambridge, Massachusetts: Blackwell.

Sacks, H., Schegloff, E. A. & Jefferson, G., 1974. A Simplest Systematics for the Organization of Turn-Taking in Conversation. *Language,* 50(4), pp. 696-735.

Sankar, A. et al., 2009. *Digital Heritage.* s.l., ACM, pp. 3503-3504.

Schegloff, E., 2007. *Sequence Organization in Interaction: A Primer in Conversation Analysis.* s.l.:Cambridge University Press.

Schell, J., 2005. Understanding Entertainment: Story and Gameplay Are One. *Computers in Entertainment (CIE) - Theoretical and Practical Computer Applications in Entertainment,* 3(1), p. 6.

Silva, A., Raimundo, G. & Paiva, A., 2003. *Tell Me That Bit Again... Bringing Interactivity to a Virtual Storyteller.* Toulouse, France, Springer Berlin / Heidelberg.

Silva, A., Raimundo, G., Paiva, A. & de Melo, C., 2004. *To Tell or Not to Tell... Building an Interactive Virtual Storyteller.* s.l., s.n.

Silverman, B. G., Johns, M., Weaver, R. & Mosley, J., 2003. *Authoring Edutainment Stories for Online Players (AESOP): Introducing Gameplay into Interactive Dramas.* Toulouse, France, Springer Berlin / Heidelberg.

Sinclair, J. M. & Coulthard, R. M., 1975. *Towards an Analysis of Discourse: The English used by teachers and pupils.* London: Oxford University Press.

Skorupski, J., Jayapalan, L., Marquez, S. & Mateas, M., 2007. *Wide Ruled: A Friendly Interface to Author-Goal Based Story Generation.* Saint-Malo, France, Springer Berlin / Heidelberg.

Steiner, K. E. & Tomkins, J., 2004. *Narrative Event Adaptation in Virtual Environments.* Santa Monica, USA, ACM, pp. 46-53.

Stevens, M. M., Abowd, G. D., Truong, K. N. & Vollmer, F., 2003. Getting into the Living Memory Box: Family Archives and Holistic Design. *Personal and Ubiquitous Computing,* 7(3-4), pp. 210-216.

Suchman, L. A., 2007. *Human-Machine Reconfigurations: Plans and Situated Actions.* 2nd ed. s.l.:Cambridge University Press.

Szilas, N., Marty, O. & Réty, J.-H., 2003. *Authoring Highly Generative Interactive Drama.* Toulouse, France, Springer Berlin / Heidelberg.

Turner, G., 1993. Film Narrative: The Universality of Story. In: *Film as Social Practice.* London: Routledge, pp. 67-85.

University of Cape Town, 2012. *Centre for Popular Memory.* [Online]
Available at: http://www.popularmemory.org.za
[Accessed 6 October 2012].

USC Shoah Foundation Institute, 2012. *Visual History Archive.* [Online]
Available at: http://dornsife.usc.edu/vhi/
[Accessed 6 October 2012].

van Hage, W., Stash, N., Wang, Y. & Aroyo, L., 2010. *Finding Your Way through the Rijksmuseum with an Adaptive Mobile Museum Guide.* s.l., Springer Berlin / Heidelberg.

Weizenbaum, J., 1966. ELIZA: A Computer Program For the Study of Natural Language Communication Between Man And Machine. *Communications of the ACM,* 9(1).

Yamazaki, A. et al., 2008. *Precision Timing in Human-Robot Interaction: Coordination of Head Movement and Utterance.* s.l., ACM.

Yamazaki, K. et al., 2009. *Revealing Gauguin: Engaging Visitors in Robot Guide's Explanation in an Art Museum.* s.l., ACM.